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(Editorial policy continued on inside back cover)

Cover Photo: Black Kingsnake *Lampropeltis* from The Cedars Natural Area Preserve, Lee County.

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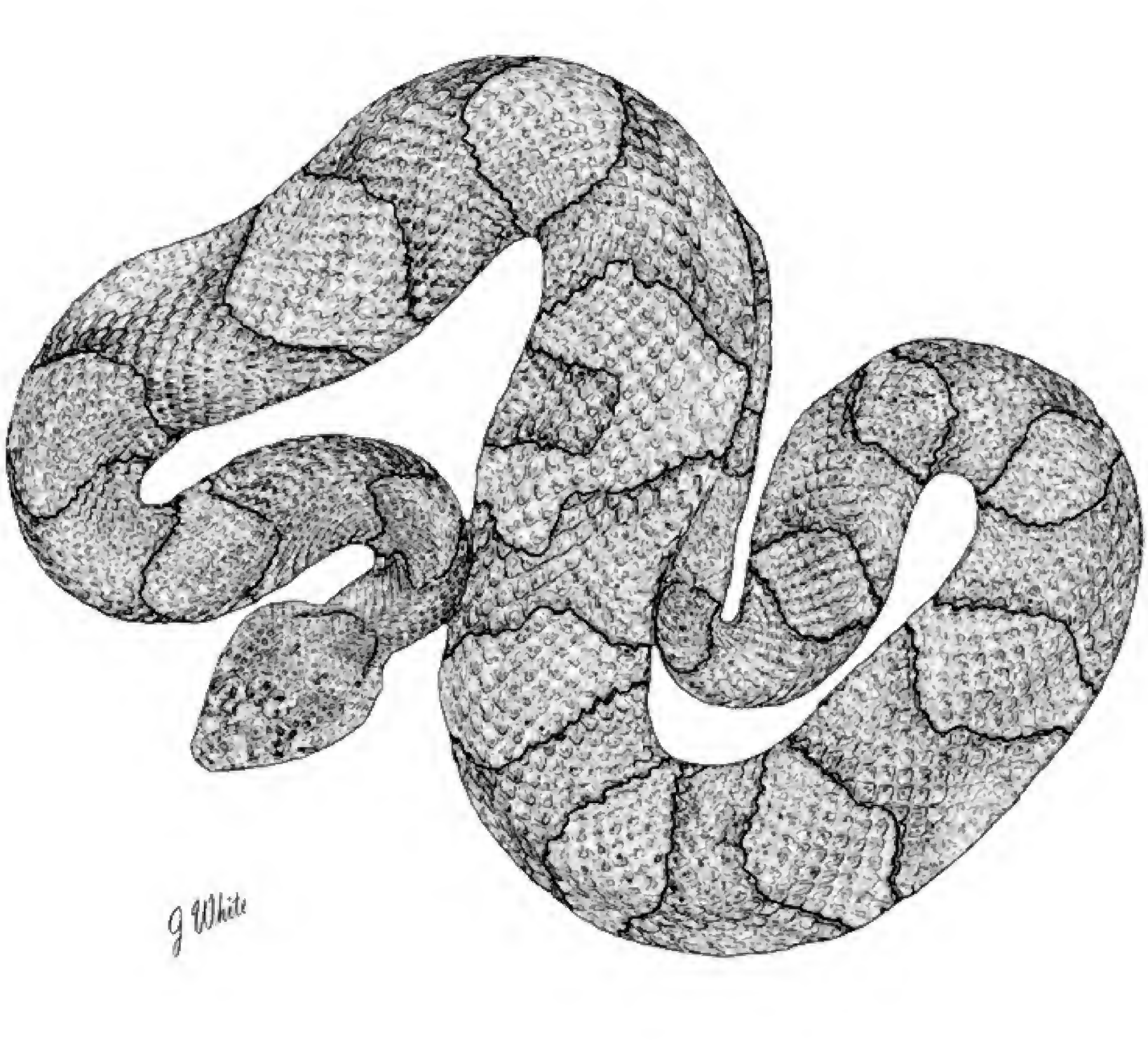
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Woodland Box Turtle (*Terrapene carolina carolina)* Population Structure in Franklin County, Virginia

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Abstract: A study of woodland turtle (*Terrapene carolina carolina)* population characteristics was carried out from 2006-2018 using opportunistic captures in and near Ferrum in Franklin County, Virginia. Of 224 new captures, there was a 2.8:1 male to female ratio and an adult to juvenile ratio of 12.2:1. There were 87 recaptures. The population structure was skewed towards older turtles with peak age class between 21-25 years. Male box turtles had a larger average carapace length and weight than females, but carapace width and plastron width were similar. Box turtles were most active from May to September, although activity of males peaked later in the season (July-August) than females (June). Most turtles were found in forests (45%), with 28.5% found in open areas (lawns, gardens) or crossing roads (24.5%). Only fifteen turtles showed signs of injury or disease. It was observed, anecdotally, that box turtles were often active immediately following rain events.

Key Words: Woodland Box Turtle, *Terrapene carolina*, Population Structure, Franklin County.

INTRODUCTION

The woodland box turtle (*Terrapene carolina carolina*) is a common terrestrial reptile found throughout eastern North America, but it is listed as a Tier III species in the Virginia Wildlife Action Plan (VDGIF, 2015) indicating some conservation concern. Although box turtles are still considered to be relatively common, their populations are threatened by high rates of adult and juvenile mortality, especially in urbanized areas, as well as a low reproductive output due to a long time to reproductive age (5-10 years) and small clutch sizes (Budischak et al., 2006; Dodd, 2001; Hall et al., 1999; Stickel, 1978).

Long-term monitoring studies of box turtles provide information on sex, size, and age distribution which allows for an understanding of population structure and conservation status (Hall et al. 1999; Budischak et al., 2006). For example, Gibbs and Steen (2005) found a trend for male-biased populations of many turtle species in the United States possibly due to higher female road mortality during their nesting movements. Female box turtles often move to open non-forested areas for nesting (Congello, 1978; Hall et al. 1999; Fredericksen, 2014), perhaps because of higher insolation at these sites that facilitates incubation. Such movements may make female box turtles more vulnerable due to mortality from vehicle collisions or mowing. Higher female mortality may reduce population recruitment. In addition, juvenile turtles are also more susceptible to predation because of their small size and a shell that is less protective compared to that of adults (Dodd, 2001). Monitoring seasonal activity and the incidence of disease and injury is also important for this species under the ongoing threat of human impacts on box turtle habitat.

In this study, I report on the results of a monitoring study of woodland box turtles from 2006-2018 at sites near Ferrum in Franklin

County, Virginia. Box turtles that were encountered at two major study sites were captured, marked, measured and released. The objective was to determine the population structure of turtles at these sites including information on size, age, sex ratio, and juvenile to adult ratio. I also recorded observations regarding turtle activity (e.g., mating, seasonal activity, habitat characteristics at capture sites, activity related to weather at the time of capture) and health status (injuries, diseases).

MATERIALS AND METHODS

Data were collected from 2006-2018 at two study sites in southwestern Virginia: the campus of Ferrum College in Franklin County and a private property approximately 2 km from the college. The elevation of the study area averages 350m and has a rolling topography characteristic of the Blue Ridge and Upper Piedmont physiographic provinces. The Ferrum College site encompasses 280 ha. Approximately 60% of this site is occupied by forests and where most box turtles were encountered. The Rambling Rose site includes 12 ha, most of which is forest that surrounds a house (dwelling of the author) with adjacent lawn and shrublands. The forests of both sites are composed predominantly of mixed hardwoods and pine species dominated by oaks (*Quercus spp.*) tulip poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), and white pine (*Pinus strobus*). Forests at Ferrum College also include a few small plantations of loblolly pine (*Pinus taeda*) and white pine and there is a 2-ha white pine plantation at the Rambling Rose site.

During the study period, all box turtles that were encountered at the two sites were marked and data were collected as detailed below. Research projects conducted at both study sites ensured a fairly consistent opportunity for encountering box turtles during the study period. Although smaller in size, more opportunity to encounter box turtles occurred at the Rambling Rose site because it is a residential property of the author.

Turtles encountered were uniquely numbered with an engraving tool on the upper left portion of their plastron. Although some wear on the numbers was evident for turtles not recaptured recently, engraved numbers were legible enough to determine the identity of the turtle. Numbers on recaptured turtles were re-engraved. Date of capture was recorded. Turtles were also measured with a tape measure or calipers for carapace length, carapace width, and plastron length. The sex of the turtle was determined based on plastron concavity and carapace shape. For juvenile turtles, considered to be ≤ 5 years of age, it was difficult to determine sex. Weight was determined with a pesola scale and age was roughly estimated by counting the rings on the carapace scutes up to an approximate age of 30, above which it was difficult to determine the age of the turtles.

Other observations at the time of capture included site characteristics (e.g., forest, lawn, road, shrubland, stream), weather activity (e.g., following rain), behavior (e.g., mating, nesting), and injuries or diseases (e.g., missing or damaged scutes, missing or damaged limbs, eye infection, ear infection, dead).

RESULTS

A total of 224 captures of individual turtles were made, including 87 recaptures of 49 individual turtles. Two turtles, one male and one female, were recaptured 7 times. Of the 224 individual captures, there were 153 males, 54 females, and 17 juveniles which

were too young to determine sex. The male to female ratio was therefore 2.8:1 and the adult to juvenile ratio was 12.2:1

It is difficult to determine the age of older turtles because of wear on the shell that obscures growth rings and there were 28 turtles that were too difficult to accurately determine age from growth rings. The population structure, however, appears to have a skewed distribution to older turtles with a peak in the age class between 21-25 (Figure 1), although this skewness may be the result of fewer box turtles in the youngest age classes. Because smaller turtles are more difficult to find, numbers of turtles in these age classes are likely underestimated.

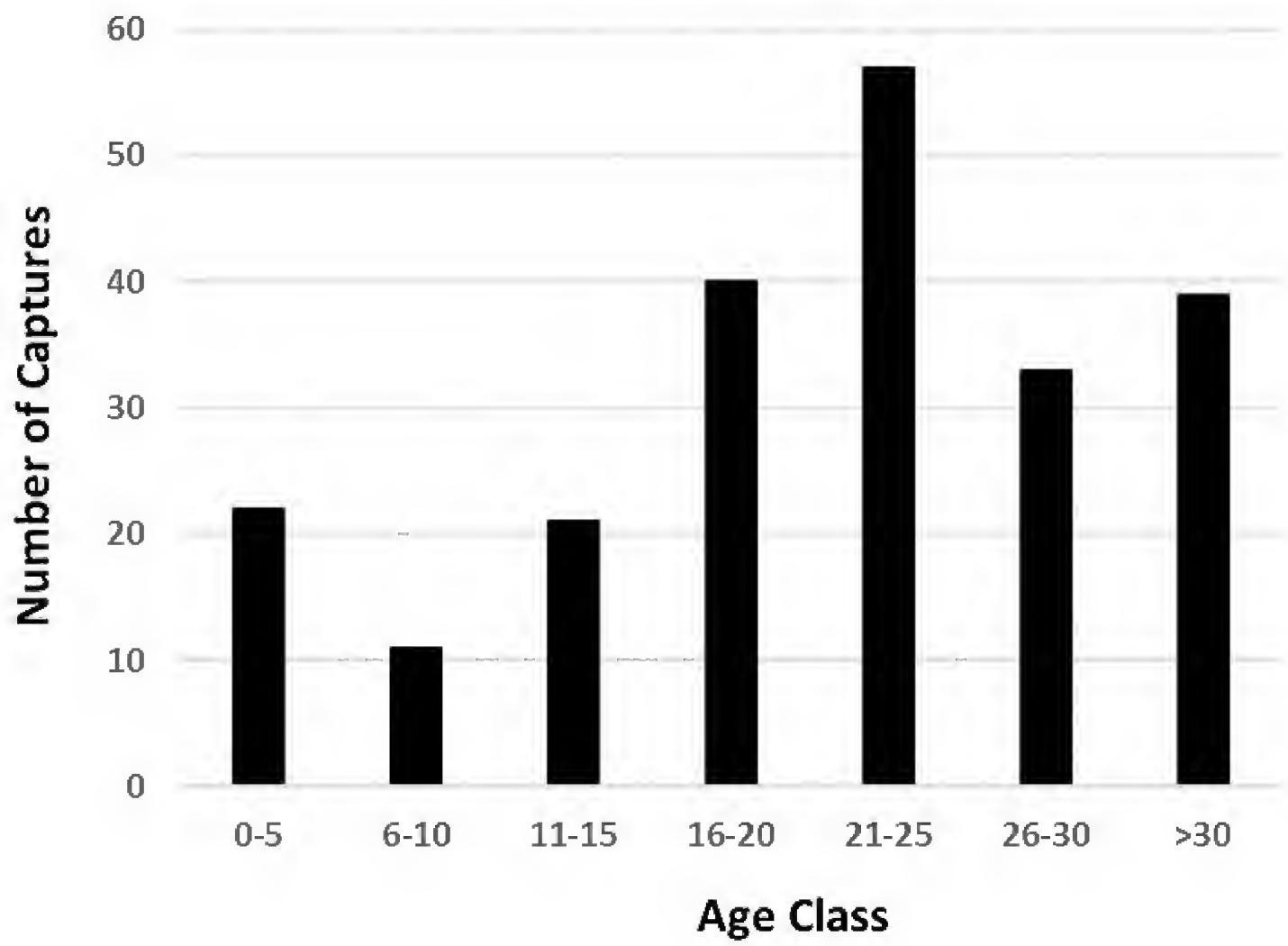

Figure 1. Age structure of box turtles captured from 2006-2018 at two sites in Franklin County, Virginia.

Male box turtles were significantly larger in carapace length ($t = 2.45$, $p = 0.02$) but weight ($p = 0.16$), carapace width ($p = 0.56$), and plastron length (0.60) were not significantly different (Table 1). Male box turtles were more elongated in form than females, which have a more compacted dome-shaped form. Plastron length, carapace length, and carapace width were very similar for juvenile turtles (< 5 years). Turtle weight increased with age until approximately the age of 15 when weight became relatively stable.

Table 1. Box turtle weight and size characteristics for males, females, and juveniles (too small to determine sex). Means are presented with one standard error in parentheses.

Sex	Weight (g)	Carapace Length (mm)	Carapace Width (mm)	Plastron Length (mm)
Male	371.5 (77.03)	125.6 (12.56)	98.7 (16.25)	111.5 (14.59)
Female	354.1 (101.50)	120.4 (15.45)	100.1 (14.94)	112.5 (17.47)
Juvenile	66.7 (32.44)	69.5 (12.96)	64.5 (10.76)	64.7 (15.05)

Most captures of box turtles occurred from May-September with a peak in June (Figure 3), but the peak for females occurred earlier in the year (June) and later for males (July) (Figure 4). A few turtles emerged in March. One turtle was found near the foundation of my house on an unusually warm day on December 9, 2012. This turtle had an ear infection and was very lethargic. No captures were made in November, January or February. Although no rainfall data were recorded for dates of captures, it was noted that turtles were often found immediately following rain events (Table 2). There were 7 pairs of turtles in copulation and 15 newly captured turtles showed some sign of injury or disease. Dates of copulation ranged from June 8 to September 27. Only one female turtle was encountered during nesting (July 9). Three turtles that had been marked were later found dead (Table 2). Turtles were found mainly in three different habitat conditions based on 298 observations: mature forest (45%), open areas (e.g., lawns, gardens) (28.5%) and crossing roads (24.5%). Three turtles were found in brushy areas, two in streams, and one in a wetland.

Box Turtle Population Structure in Franklin County, VA

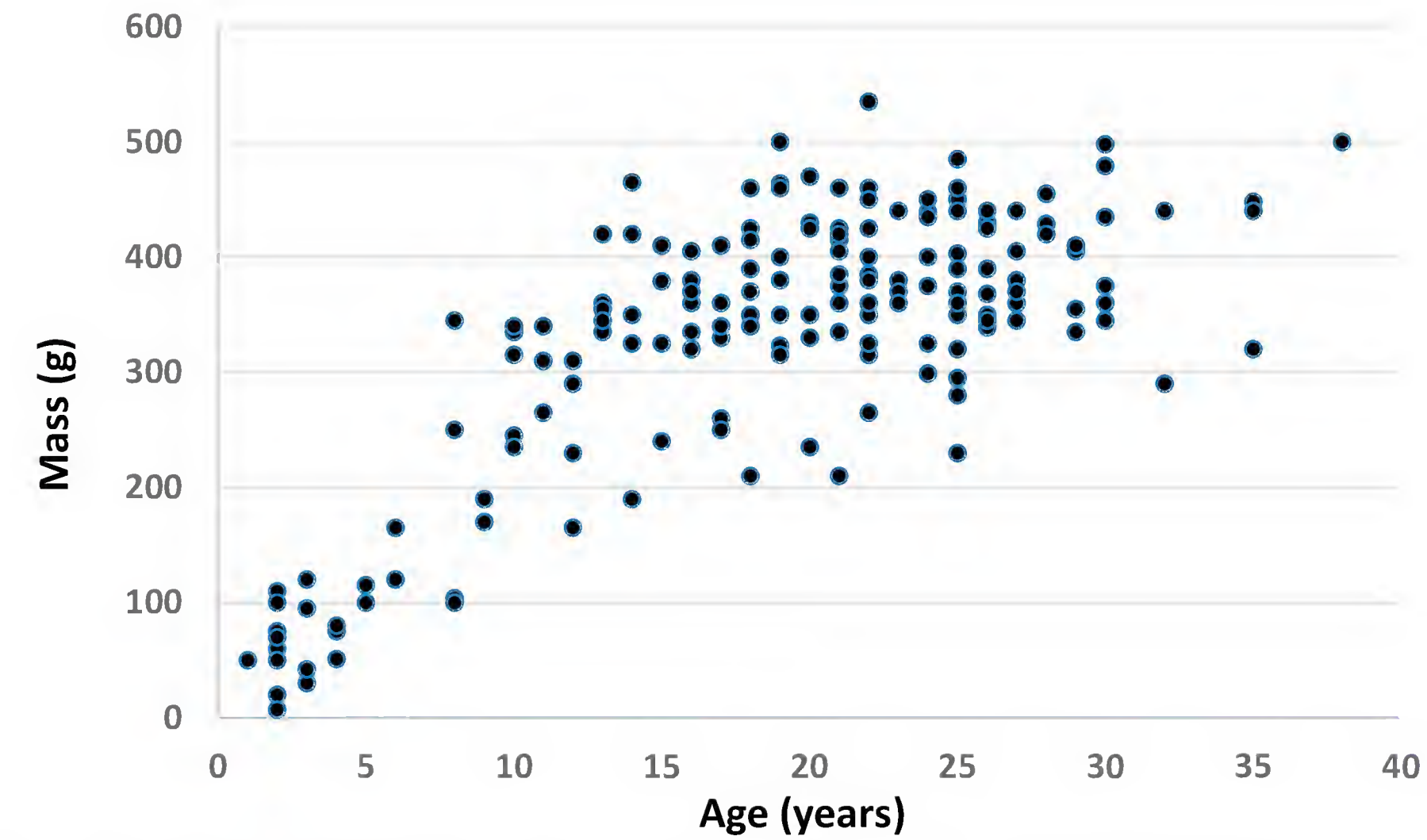

Figure 2: Relationship between turtle age and mass of all initial captures (excludes recaptures) recorded during the study period at both sites.

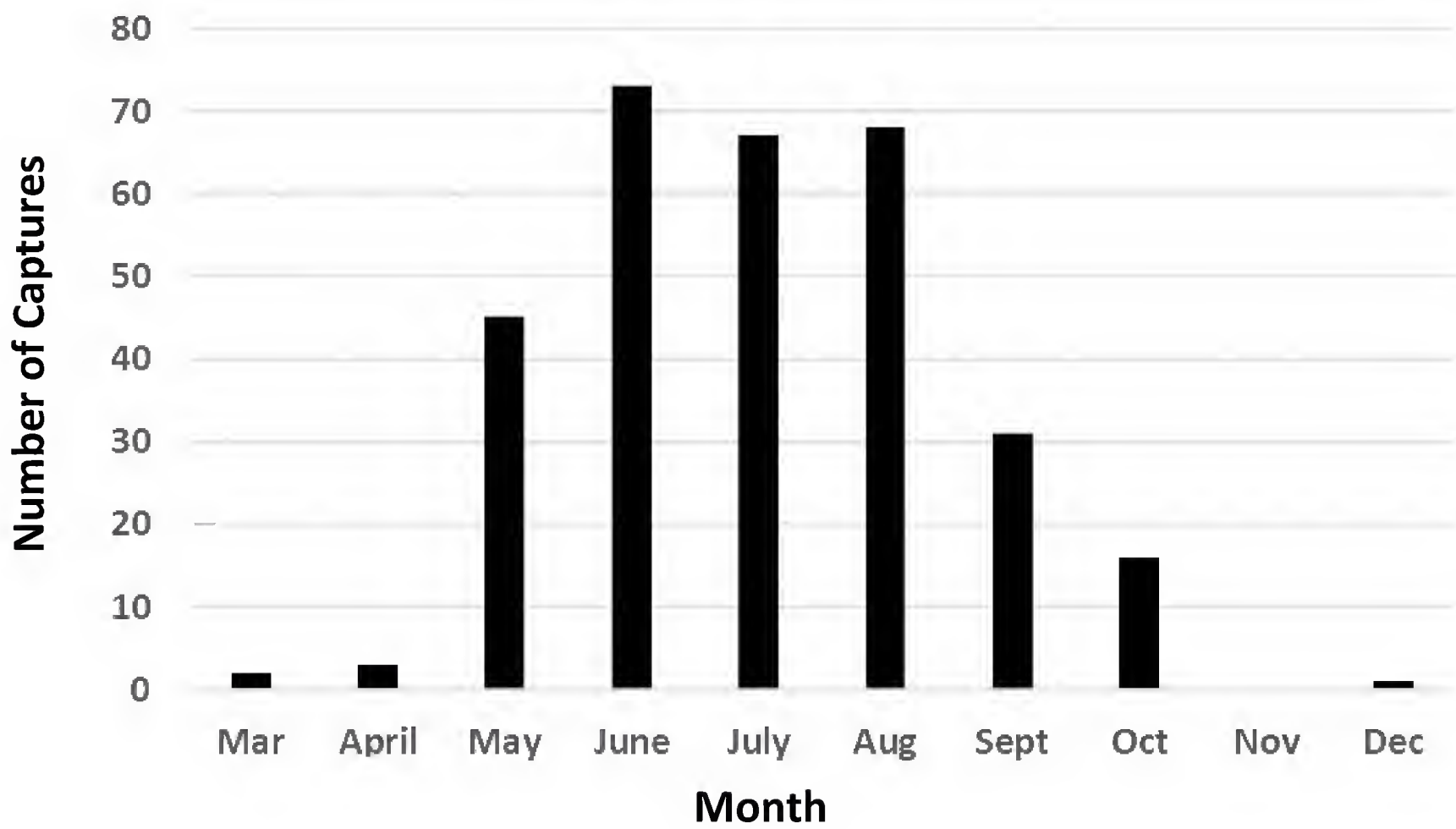

Figure 3: Total captures and recaptures of box turtles by month in which the capture was made.

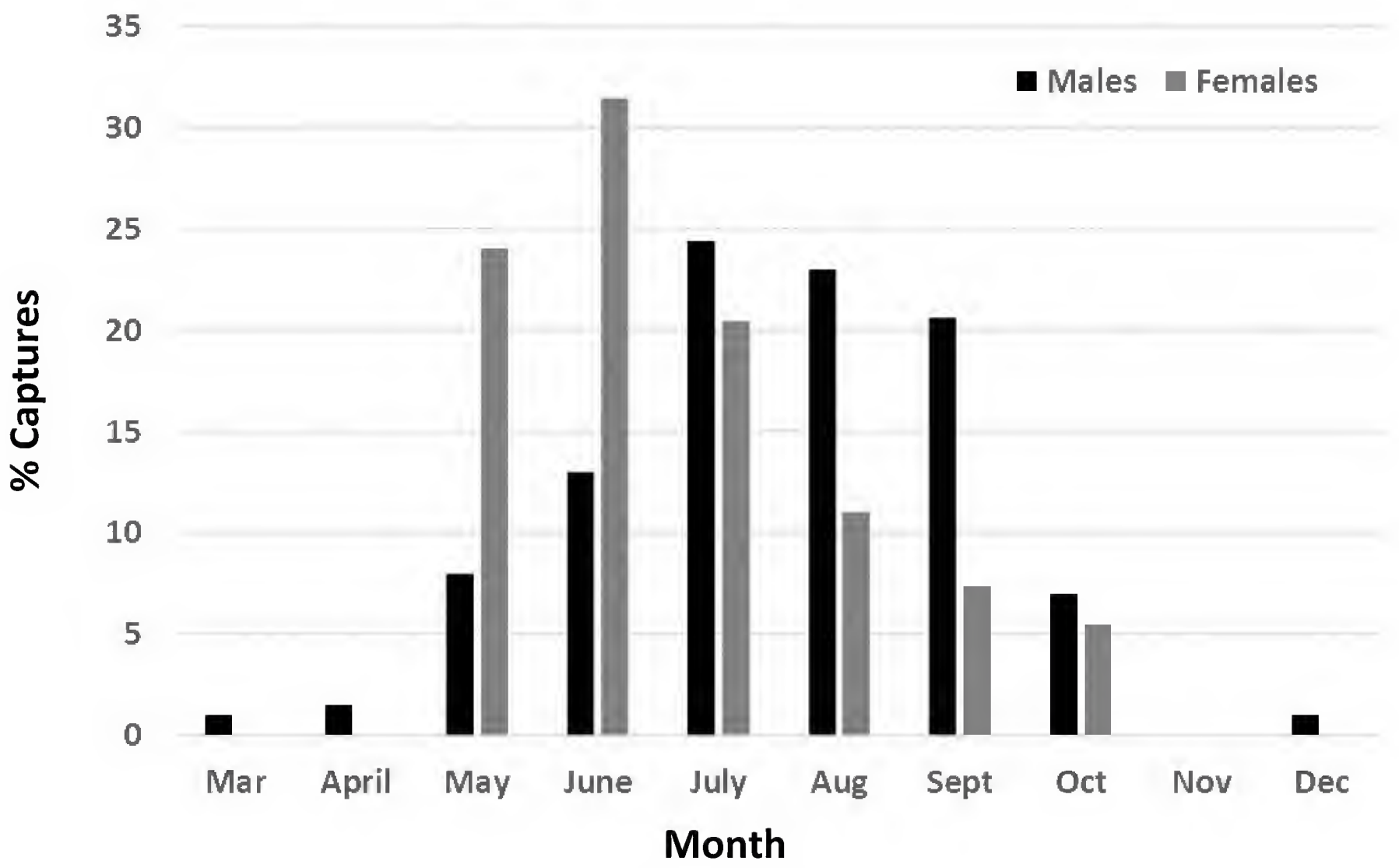

Figure 4. Percent captures for male and female box turtles.

Table 2: Observations during capture of box turtles including weather, behavior, and injury.

Found during/ after rain	Nesting	Copulation	Male conflict	Ear infection	Eye infection	Shell damage	Leg injury	Dead
24	2	7	1	4	2	7	2	3

DISCUSSION

The most notable observation in this study is the highly skewed male:female ratio (2.8:1). Many other studies have found male-skewed sex ratios (Dolbeer1969, Hall et al. 1999, Stickel 1989, West and Klukowski 2016). The male:female ratio is this study however is larger than these studies (1:2 – 2.0). Budischak et al. (2006) found a ratio skewed towards females (male:female of 0.66:1) in North Carolina. In a study in Delaware, Nazdrowicz et al. (2008) found male-skewed sex ratios at two study sites (one site with a 3:1 male:female ratio), but balanced age distributions at two other sites.

At a site in Central Virginia, Wilson and Ernst (2005) found a 1:1 sex ratio of box turtles. It is not certain why the sex ratio is so highly skewed towards male in this study. In

a radiotelemetry study (Fredericksen 2014) using a subset of the turtles in this study, I found that female turtles moved long (> 1 km) distances to nesting locations in the early summer to habitats with more sunlight (recent clearcut surrounded by lawns and hayfields). Such movements may make turtles more vulnerable to road and mowing mortality as proposed for turtles in general by Gibbs and Steen (2005), particularly in fragmented landscape. Iglay et al. (2007), however, found that box turtles in isolated areas within fragmented landscapes moved less than those in more continuous habitat. Dodd (1997) proposed that females that nest in forests are more likely to produce more males than females because of cooler temperatures of forests tend to produce more males. In this study, more turtles were found in forest habitats than open areas.

Juvenile turtles (< 5 years) represented a small number (17) of the captures of this study. Observation bias may certainly be a potential explanation for the low number of juvenile captures because they are difficult to find

(Stickel 1950, Wilson and Ernst 2005) and do not appear to have a large home range (Fredericksen 2014). Juvenile turtles may confine themselves to areas with dense cover because they are vulnerable to predation because of their small size and softer shell (Dodd 2001, Jennings 2007).

A clear correlation between age and mass was observed until box turtles reached an age of approximately 20 years. Budischak et al. (2006) found similar uncoupling between age and mass in older turtles as well as more variability in this relationship for older turtles. Male turtles weighed more than females and had longer carapaces, but females had slightly longer carapace widths and plastron lengths. Differences between male and female carapace dimensions in this study are similar to those reported in other studies (Stickel and Bunck 1989; Budischak et al. 2006; West and Kluckowski 2016). The majority of box turtles found in this study were between 16-30 years, which differed from a study by West and Kluckowski (2016) in Tennessee who found most turtles to be between 14-20 years old, with few individuals older than 20 years old. Box turtle activity dramatically increased in May and then declined sharply in September, corresponding to other studies of the seasonal activity and overwintering behavior of turtles at these same study sites (Ellington et al. 2007, Fredericksen 2014).

Monitoring of these populations will continue including an assessment of population changes due to potential impacts of climate change and human development. Currently, the two study sites have relatively low risk of mortality because there are few roads and limited logging and deforestation, but this may change over time.

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Results of the Thirteenth Annual HerpBlitz: The Cedars Natural Area Preserve, Lee County Virginia.

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Abstract: The Cedars Natural Area Preserve in Lee County was surveyed in May, June and August 2018. A total of twenty-eight species (8 anurans, 9 salamanders, 2 turtles, 3 lizards and 6 snakes were reported, including new county records for *Scincella lateralis* and *Virginia valeriae*. A previously unvouchered record for *Pseudacris feriarum* was verified. Some rarely seen species such as *Aneides aeneus, Eurycea lucifuga,* and *Lampropeltis nigra* were observed.

Key Words: Herpetological Survey, The Cedars Natural Area Preserve, Lee County, *Aneides aeneus, Eurycea lucifuga, Pseudacris feriarum, Graptemys geographica, Lampropeltis nigra, Scincella lateralis,* and *Virginia valeriae.*

INTRODUCTION

The Cedars Natural Area Preserve (CNAP) consists of 820 hectares (2024 ac) of land in 24 different tracts in Lee County Virginia. The land is being preserved because it lies within a karst region characterized by thin soils over easily dissolved limestone, which produces a rolling, rocky landscape with numerous sinkholes and caves. Because of the thin soil and underlying bedrock, most trees have difficulty growing, producing an arid landscape with numerous grassy meadows. It is an open area within an otherwise forested region. It is named for the Red Cedar (*Juniperus virginiana*) which grows throughout the area (Calcareous Glade).

The CNAP began in 1996 with the purchase of 20 ha (50 ac) by The Nature Conservancy. The land was transferred to the Virginia Department of Conservation and Recreation the following year, and they currently oversee management of the area. Additional tracts of land are purchased as funds and the land become available. An additional 60 ha (250 ac) was purchased recently in 2015. The Cedars region covers an area approximately 50-65 km (30-40 mi) along the Powell River in the Ridge and Valley Physiographic Province. The Powell River joins the Clinch, then Tennessee, and finally the Ohio before flowing into the Mississippi and the Gulf of Mexico.

There are numerous rare plants adapted to the thin nutrient-poor soil and preservation of these species is one of the primary conservation goals of the Preserve. CNAP is also home to the Lee County Cave Isopod *Lirceus usdagalun* found only in three caves in Lee County, all connected by groundwater. The Lee County Cave Isopod is federally listed as an endangered species (US Fish & Wildlife Service, 1997).

The DGIF's FWIS Database currently lists 19 reptile species documented for Lee

County, including 7 tiered species (tier 3-4). There are also 29 amphibians listed, including 5 tiered species (tier 1-4). Amphibians and reptiles found in Lee County which are not common elsewhere include the Hellbender (*Cryptobranchus a. alleganiensis*), Mudpuppy (*Necturus maculosus*), Green Salamander (*Aneides aeneus*), Black Mountain Salamander (*Desmognathus welteri*), Cave Salamander (*Eurycea lucifuga*), Kentucky Spring Salamander (*Gyrinophilus porphyriticus duryi*), Midland Mud Salamander (*Pseudotriton montanus diastictus*), Southern Ravine Salamander (*Plethodon richmondi*), Eastern Black Kingsnake (*Lampropeltis nigra*), Northern Map Turtle (*Graptemys geographica*), and Stripe-necked Musk Turtle (*Sternotherus minor peltifer*). The CNAP was chosen as a survey site partly because of the opportunity to see many less-common species, the unique nature of the Cedar Glades, and the relatively few previous surveys in this most southwestern county in Virginia.

There have been four surveys in Lee County since 1958 (Burger, 1974; 1975; Mitchell and Pague, 1984; Roble and Hobson, 2002; Meade, 2003). Burger (1974, 1975), during a 10-day collecting period lasting from 9-18 July 1958 in the Jonesville area and in the Cumberland Gap National Historical Park, recorded 19 species of amphibians and 18 species of reptiles. Mitchell and Pague (1984) conducted a 13-day survey from 1-13 July, in 46 sites spread across Lee County. Their efforts yielded 25 species of amphibians and 21 reptiles. Roble and Hobson (2002) surveyed CNAP when it contained only 287 ha (709 ac), from 1995-2002. They conducted 1-2 day surveys during which they overturned rocks and logs, examined caves and sinkholes, recorded incidental observations, and included one night of road cruising. They found 24 species including 15 species of amphibians and 9 species of reptiles. They surveyed the more eastern and central tracts of land, whereas the current survey focused attention on the western tracts obtained only after this earlier survey. Meade (2003) surveyed Cumberland Gap National Historical Park, approximately 50 km (30 mi) west of CNAP. He surveyed selected plots in streams, floodplains, mountain meadows, caves, cliffs and bogs using area-constrained searches, artificial cover boards, night driving and incidental observations. He found 35 species including 23 species of amphibians and 12 species of reptiles. The CNAP presented a unique opportunity to survey an unusual habitat in far southwestern Virginia.

Survey Sites

1. Bowen Tract:
This tract contains gently rolling hills including forested and grassland areas. The team concentrated on a forested bluff overlooking the Powell River. The dominant trees included Sweet Gum, White Oak, Chinquapin Oak, Sugar Maple and Cedars. The understory included Dogwood, Redbud, Poison Ivy and Greenbrier. There was an abundance of flat rocks, rocky outcroppings, and some tin sheets.

2. Coy and Maxie Cope Tract:
This tract of land contains several dilapidated buildings with tin and wood debris scattered around the buildings. The land is grassy and open with many exposed limestone rocks scattered across the open fields. The dominant trees were White Oak, Hickory and some Junipers in the meadows. A small continually-running spring entering a cave is an interesting geologic feature of this property. Around the spring there are steep limestone walls with many crevices. The limestone and outflowing spring are covered

in thick mats of moss. A small vernal pool was found on the edge of the forested section.

3. Fulks Tract
The Powell River marks the southern border of this property. Much of this property is open grassy field. There is a hardwood forest containing Chinquapin Oak, White Oak, Sugar Maple, Shagbark Hickory, and Black Walnut, with Winged Elm and Redbud in the understory. Of geologic interest is a major limestone cave (Solgener Cave) with a stream flowing out of the mouth of it.

4. Natural Bridge Cave Site
This site includes a stream, which begins on the Barton Tract, flows onto the Mason-Barton Tract where it flows into a cave, under Co. Rt. 662 then off the CNAP. The stream was surveyed beside Co. Rt. 662 where the stream flows under the road.

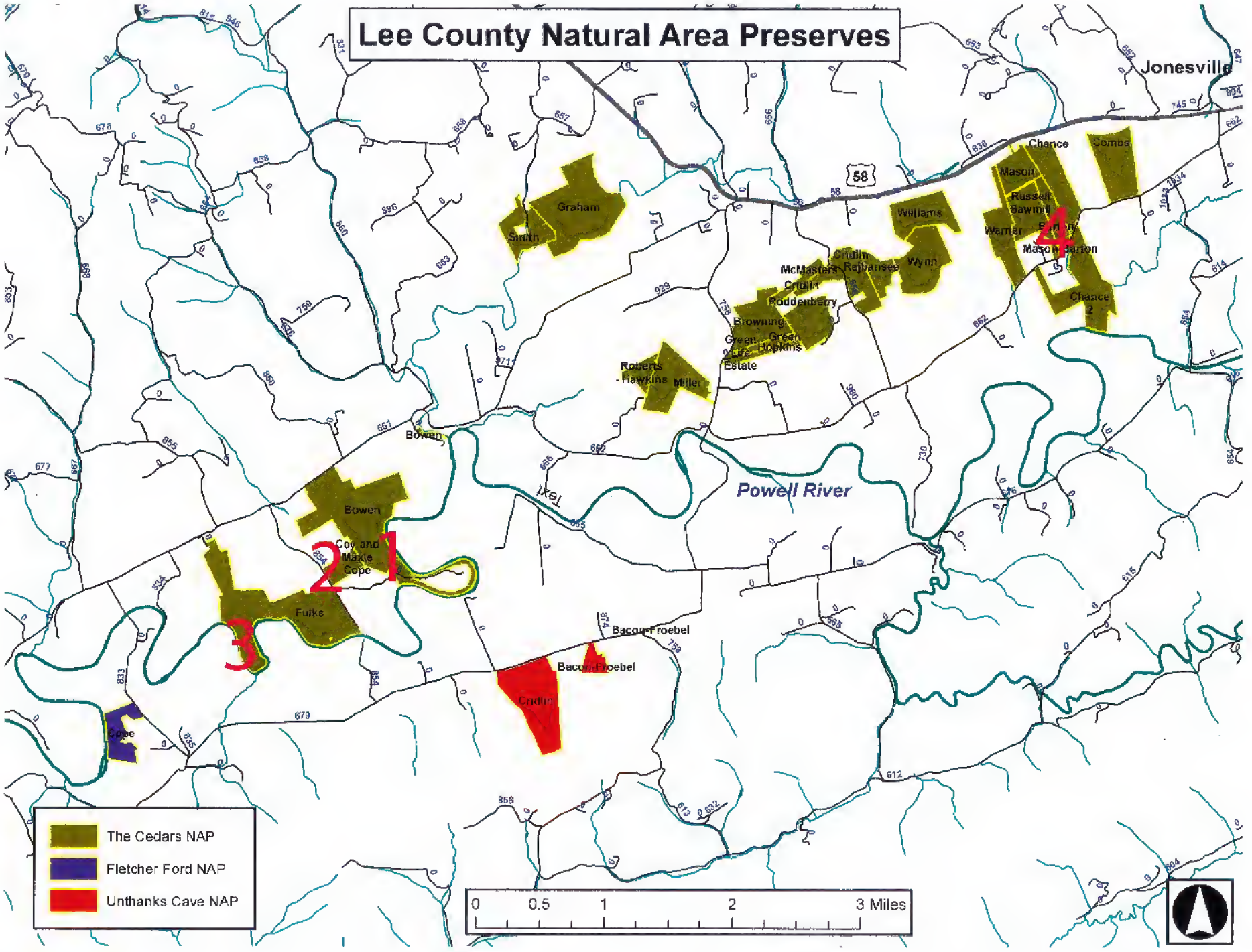

Figure 1. Map of The Cedars Natural Area Preserves with survey sites numbered in red.

MATERIALS AND METHODS

The Cedars Natural Area Preserve was visited three separate times in 2018. The first visit was a presurvey conducted by JG and PS on 24 May. The second visit was the herpblitz conducted on 9 and 10 June. The third visit was conducted by JG, PS, and MB on 2 August. During this last survey

amphibians were swabbed and tail tips collected to test for the presence and prevalence of Bd (*Batrachochytrium dendrobatidis*) and Ranaviral infections. The results of these data will be published later, elsewhere.

The following techniques were used by surveyors during the herpblitz survey: hand capture, visual observations, rolling over but replacing cover objects such as logs and rocks, and listening for calling anurans, both at day and at night. Additionally, five baited hoop turtle traps, three minnow traps and two chimney crayfish traps were placed in the Powell River. Animals hand captured were examined visually for malformations, diseases, injury, and parasites. Animals were released at the site of capture. Digital photos were taken as vouchers for species. Data sheets were kept with information on each animal and the microhabitat where the animal was found. The data sheets were deposited in the VHS Archive. Table 1 below gives a summary of how much time was spent at each survey site.

Table 1. Summary of work effort at the different sites sampled during The Cedars NAP survey.

	Site 1	Site 2	Site 2[a]	Site 3	Site 3[a]	Site 4
Number of surveyors	9	21	7	21	9	2
Hours surveyed	1.3	1.75	1	2	.75	.5
Person hours of survey effort	11.7	36.75	7	42	6.75	1.0

2[a] = night hike on 9 June 2018, 3a = survey of powerline cut on Fulks track and Powell River on 10 June

RESULTS

The Cedars presurvey of 24 May, the survey of 9 and 10 June, and a post survey visit on 2 August, yielded observations of 142 total animals. Twenty-eight species were documented including 17 amphibians (8 anurans and 9 salamanders) and 11 reptiles (two turtles, three lizards, and six snakes). This survey yielded 2 county records and many western range extensions for different species. We also documented *Pseudacris feriarum* reported by Roble and Hobson (2002) but not vouchered at that time. Table 2 below summarizes information from each of the surveyed sites. Following the data table is an annotated species list summarizing observations made for each species. Common and scientific names follow Crother, 2017.

Table 2. Summary of the number of amphibians and reptiles observed at each site of The Cedars Natural Area Preserve. c = calling male anuran, L = larvae, m = metamorphs, s = shed skin 1^a = disease survey conducted on 2 August, 2^a = night hike on 9 June, 2b = presurvey observations taken on 24 May, 2^c = disease survey conducted on 2 August, 3a = survey of powerline cut on Fulks track and Powell River on 10 June, 3b = disease survey conducted on 2 August.

	Bowen		Coy and Maxie Cope				Fulks			NB	
Species/Site	1	1^a	2^b	2	2^a	2^c	3	3^a	3^b	4	Total
Date	6/10	8/2	5/24	6/9	6/9	8/2	6/9	6/10	8/2	6/8	
Amphibians											
Anaxyrus a. americanus						1				1	2
Anaxyrus fowleri	1						1				2
Hyla chrysoscelis			1c	1c	1c						3
Lithobates catesbeianus									1		1
Lithobates clamitans										1	1
Lithobates palustris			1				1				2
Lithobates sylvaticus				m							1
Pseudacris feriarum			L				L				
Ambystoma maculatum				L		L					
Aneides aeneus							1				1
Eurycea cirrigera									1	1	2
Eurycea l. longicauda			5	1	2						8
Eurycea lucifuga			1	3	6	13	2		1		26
Notophthalmus v. viridescens				3		20					23
Plethodon glutinosus	1		1								2
Plethodon kentucki				4	1	13					18
Pseudotriton r. ruber			1								1
Reptiles											
Graptemys geographica								2			2
Terrapene c. carolina	2			2		1					5
Plestiodon fasciatus	2	1		1			6			1	11
Sceloporus undulatus	2	2		3			1	1			9
Scincella lateralis	3	1					2	1			7
Carphophis a. amoenus	6							1			7
Coluber c. constrictor			1				1	1			3
Diadophis punctatus edwardsii						1	1				2
Lampropeltis nigra							1				1
Pantherophis alleghaniensis							s				
Virginia v. valeriae	2										2
Total	19	4	11	19	10	49	17	6	3	4	142

Annotated Checklist

Amphibians

1.*Anaxyrus a. americanus* (American Toad)
One American Toad was found on Rt. 662 near the Natural Bridge Cave site. Another American Toad was found sitting in gravel at the mouth of the large cave on the Coy and Maxie Cope tract.

2. *Anaxyrus fowleri* (Fowler's Toad)
One juvenile and one adult Fowler's Toads were found on the Bowen and Fulks tracts on 10 and 9 June. A Fowler's toad was heard calling next to the Powell river on the Fulks tracts on the night of 9 June while driving to the night survey.

3. *Hyla chrysoscelis* (Cope's Gray Treefrog)
Cope's Gray Treefrogs were heard calling on the Bowen Tract and Coy and Maxie Cope tract during our pre-survey of the Cedars on 24 May 2018. Males were heard calling both during the day and night. A few tadpoles collected in a road rut on the Fulks property on 24 May were taken and reared. These tadpoles were found to be Cope's Gray Treefrogs. Cope's Gray treefrogs were observed calling during the day and night at the Coy and Maxie Cope site on 9 June 2018.

4. *Lithobates catesbeianus* (American Bullfrog)
One juvenile American Bullfrog was hand captured in the stream exiting Solgener Cave on the Fulks Tract. This animal was found to have two chiggers imbedded in the skin of one hind foot.

5. *Lithobates clamitans* (Green Frog)
One adult frog was found beside the stream at the Natural Tunnel Cave site on the 24 May pre-survey.

6. *Lithobates palustris* (Pickerel Frog)
A small adult Pickerel Frog was found on a night survey of the spring-fed stream and cave site at the Coy and Maxie Cope tract on 24 May 2018.

7. *Lithobates sylvaticus* (Wood Frog)
Numerous metamorphic Wood Frogs were found in and along the edge of a small vernal pond on the Coy and Maxie Cope tract. This record slightly extends the westernmost documented range of this species in Virginia (Roble and Hobson, 2002).

8. *Pseudacris feriarum* (Upland Chorus Frog)
Numerous *Pseudacris* tadpoles were found in two cement tanks; one on the Coy and Maxie Cope tract and one on the Fulks tract. *Pseudacris brachyophona* and *P. crucifer* are known from Lee County, but not *P. feriarum*. Roble and Hobson (2002) heard but did not record a chorus in May 1999. A few tadpoles were reared through metamorphosis by JG and appeared to be *P. feriarum*. One metamorph died, was preserved in alcohol and tissues subjected to DNA sequence analysis using the Cox1 gene fragment. The DNA sequence was identical to *P. feriarum,* confirming the identity of the tadpoles. This is the first verified occurrence of the Upland Chorus Frog in Lee County, and a westward expansion of the known range, the next nearest location being approximately 100 km to the east in eastern Washington County.

9. *Ambystoma maculatum* (Spotted Salamander)
Many larval Spotted Salamanders were dip-netted from a small vernal pool on the Coy and Maxie Cope tract. At least 20 late stage larvae from this same pool were observed during the 2 August survey. This observation represents only the second record for this species in Lee County and a 33 km western

range extension from the other collection site, reported in Fulton et.al., (2014).

10. *Aneides aeneus* (Green Salamander)
Only one adult Green Salamander was found during this survey. This animal was found in a rock crevice at the mouth of a cave on the Fulks tract.

11. *Eurycea cirrigera* (Southern Two-lined Salamander)
One adult was found under a rock by a stream at the Natural Tunnel Bridge Cave site (N36°40'01.2", W 83°09'19.4"). This record extends the westernmost documented range for this species in Virginia (Mitchell and Reay, 1999). One two-lined salamander found on 2 August was on the wall of Solgener Cave on the Fulks tract, and was observed to have two reddish cysts, one on the upper hind limb and one on a hind foot. These cysts appeared to be consistent with larval chigger parasitism.

12. *Eurycea l. longicauda* (Long-tailed Salamander)
Five adult Long-tailed Salamanders were found under rocks near a spring at the Coy and Maxie Cope tract 24 May 2018. Three additional observations were made of this species on 9 June at the Coy and Maxie Cope tract. One salamander was found under a rock and the other two were found at night along a spring. Roble and Hobson (2002) reported finding Long-tailed Salamanders on the Lee County airport property to the east of this site. Their observation was the westernmost documented population at the time, so this observation represents a small (3 km) western range extension for this species.

13. *Eurycea lucifuga* (Cave Salamander)
One Cave Salamander was found sitting at the opening of a rock crevice near the cave at the Coy and Maxie Cope tract on 24 May. This animal was found after dark. On 9 June Cave Salamanders were found in three different caves, two caves from the Coy and Maxie Cope tract and one cave from the Fulks tract. All animals were found in the open on cave walls in rock crevices. On 2 August, 13 Cave Salamanders were found at the mouth of two separate caves during a nighttime survey.

14. *Notophthalmus v. viridescens* (Red-spotted Newt)
Three adult Red-spotted Newts were observed in a vernal pool on the Coy and Maxie Cope tract. Twenty adult Red-spotted Newts were dipnetted from the same vernal pond on 2 August 2018.

15. *Plethodon glutinosus* (Northern Slimy Salamander)
One adult slimy salamander was found on moss beside a small spring fed stream on 24 May at the Coy and Maxie Cope tract. This animal was found after dark. A juvenile was found on the Bowen tract under a log.

16. *Plethodon kentucki* (Cumberland Plateau Salamander)
A mixture of adult and juvenile Cumberland Plateau Salamanders were found at two different caves on the Coy and Maxie Cope tract. All salamanders were found in rock

crevices or on the walls of the caves. Thirteen juvenile Cumberland Plateau Salamanders were collected from a cave at the Coy and Maxie Cope tract on 2 August.

17. *Pseudotriton r. ruber* (Northern Red Salamander)
A large *Pseudotrition r. ruber* larva was found sitting in a small pool in a spring fed stream at the Coy and Maxie Cope tract on 24 May 2018. This was a nighttime observation.

Reptiles

18. *Graptemys geographica* (Northern Map Turtle)
Two adult Northern Map Turtles were observed basking on a log and a rock in the Powell River at the Fulks tract on 10 June.

19. *Terrapene c. carolina* (Woodland Box Turtle)
Two box turtles were found under tin at the Coy and Maxie Cope site. The Bowen site yielded observations of one adult turtle by a building and one shell on the road. Another adult female turtle was observed sitting on the forest floor on 2 August at the Coy and Maxie Cope tract.

20. *Plestiodon fasciatus* (Common Five-lined Skink)
One juvenile skink about discovered under a piece of bark at the Natural Tunnel Bridge Cave site on 24 May. During the survey Common Five-lined Skinks were found on log piles, under rocks, on buildings, and in logs at the Bowen, Coy and Maxie Cope, and Fulks tracts. A large adult female was found under a rock at the Bowen tract on 2 August.

21. *Sceloporus undulatus* (Eastern Fence Lizard)
During the presurvey an adult Eastern Fence Lizard was found on the road leading to the Bowen tract. Adults were found on rocks, under rocks, and near old buildings at the Bowen, Fulks, and Coy and Maxie Cope tracts. On 2 August two newly hatched fence lizards were found under rocks at the Bowen tract.

22. *Scincella lateralis* (Little Brown Skink)
Little Brown Skinks were observed on 9 and 10 June foraging and under rocks at the Bowen and Fulks tracts. This represents a new county record (Mitchell and Reay, 1999) A photograph from the Bowen tract on 10 June was deposited in the VHS Archive (# 542) as a voucher. A newly hatched Little Brown Skink was observed on a grassy path at the Bowen tract on 2 August. Future surveys between Lee County and Patrick County, previously the most western range for this species in Virginia, may yield additional populations between these two locations.

23. *Carphophis a. amoenus* (Eastern Wormsnake)
Six adult wormsnakes were found under rocks and logs at the Bowen tract. One adult wormsnake was found under a rock in the power line right-of-way on the Fulks tract. Several snakes were observed to have scattered scale damage.

24. *Coluber c. constrictor* (Northern Black Racer)
A single adult black racer was found under a piece of tin by an old building on the Coy and Maxie Cope tract on 24 May. During the

survey weekend two additional animals were observed at the Fulks tract. One adult was found on the road and the other adult was found under a piece of tin.

25. *Diadophis punctatus edwardsii* (Northern Ring-necked Snake)
One large adult Northern Ring-necked Snake was found under a large rock at the Fulks tract. The animal had a full yellow neck band and spots on the ventrum. A juvenile ring-necked snake was found in a rock crevice at the mouth of a large cave at the Coy and Maxie Cope tract on 2 August.

26. *Lampropeltis nigra* (Eastern Black Kingsnake)
A single adult Eastern Black Kingsnake was found between a decomposing cedar log and a large limestone rock in the power line right-of-way on the Fulks tract (VHS Archive # 541). On 14 June, Stephen Grayson found a juvenile Eastern Black Kingsnake under a rock along the roadside at the McMasters Cridlin Roddenberry Tract.

27. *Pantherophis alleghaniensis* (Eastern Ratsnake)
A shed Eastern Ratsnake skin was found on the Fulks tract near an old barn on 9 June.

28. *Virginia v. valeriae* (Eastern Smooth Earthsnake)
Two adult Eastern Smooth Earthsnakes were found under a rock and under tin, respectively, at the Bowen tract on 10 June. One of the snakes appeared to have small patch of damaged scales on its head. This represents a county record (Mitchell, 1994; Mitchell and Reay, 1999; VHS Archive # 543) and now stands as the western-most population in Virginia.

DISCUSSION

Now that two surveys have been made of the Cedars Natural Area Preserve, Roble and Hobson's and this one, we can report that the Cedars Natural Arear Preserves has a minimum of 32 species of amphibians and reptiles (see table 3 for a comparison of the results from the two surveys). This total includes 19 species of amphibians (10 anurans and 9 salamanders) and 13 species of reptiles (2 turtles, 3 lizards, and 8 snakes). Additional work may add further information about the species inhabiting this area. This survey yielded two new records for Lee County, *Scincella lateralis* and *Virginia valeriae*. Since there were two smooth earthsnakes and seven ground skinks, the lack of previous records for these species is likely due to a lack of surveys in this far western county rather than their being at low densities. In addition, the survey was able to voucher *Pseudacris feriarum* which had been reported by Roble and Hobson (2002) but not vouchered them. Several rare salamanders, including *Aneides aeneus, Eurycea lucifuga,* and *Plethodon kentucki* were observed. Southwestern Virginia has many salamanders not frequently seen on more eastern surveys, and was one reason Lee County was chosen for this survey. The

finding of an adult Eastern Black Kingsnake, and the resulting photo frenzy was another highlight of the survey.

Several species we hoped to see but were not encountered, include the Eastern Hellbender and Common Mudpuppy, which have been reported previously from the Powell River. The Midland Mud Salamander, Kentucky Spring Salamander, and Black Mountain Salamander are also known from Lee County but not observed at The Cedars, demonstrating the list of amphibians and reptiles might still be expanded by further survey work.

The Virginia Department of Conservation and Recreation, working in partnership with The Nature Conservancy, are continuing to buy and add more landholdings to this preserve. As this natural area preserve grows, it is imperative that surveys continue to be conducted to learn more about the herpetofauna of this area. In addition to continuing to inventory species, it is also important that the harder work of adding natural history information on each species continues. Species in this area occupy habitats in the most western region of Virginia. The differences in proximity to the ocean, unique soils and vegetation, and a watershed draining to the Mississippi River rather than Chesapeake Bay might cause differences in anuran calling dates, breeding cycles, egg laying dates, clutch sizes, and anatomical size differences compared to species in other regions of Virginia.

Roble and Hobson (2002) reviewed the species that might still be found in Lee County. The authors encourage readers to review their account to better understand species still likely to be added to the list of Cedars Natural Area Preserve herps. Future surveyors should visit the property during different seasons to pick up early breeding or fall breeding amphibians. The authors had difficulty setting turtle traps in the bedrock of the Powell River. Different turtle trapping techniques could better sample the turtle fauna in the Powell River. More and better sampling techniques for the large aquatic salamanders could increase information on the occurrence of these species in the Powell River and tributaries flowing into the river. The sampling of environmental DNA might prove particularly useful.

Education concerning the spread of fungal infections should be a priority of managers of this preserve. White Nose Syndrome found in bats has been detected in caves on this property. The causative agent *Pseudogymnoascus destructans* (PD) can be spread by contaminated shoes, clothing or equipment. Signage or other education materials should be produced to educate the public about how to disinfect shoes and equipment. This would also help reduce the spread of fungal diseases such as BD and SNF (Snake Fungal Disease) which are currently spreading in amphibians and snakes. BD and Ranaviral infections have been detected in wild populations of Green Salamanders in Wise and Dickenson Counties, two counties adjacent to Lee County (Blackburn et.al., 2015). The 2 August survey swabbed a number of salamanders. The results of the subsequent test for BD and Ranavirus will be published elsewhere. It is important to get base-line date on infection rates to better determine if this infection is a problem for resident amphibians and to aid managers of this property.

Table 3. Species comparison for two surveys conducted at the Cedars Natural Area Preserve.

Species	Roble and Hobson, 2002	Gibson and Sattler, 2018
Amphibians		
Anaxyrus a. americanus	*	*
Anaxyrus fowleri	*	*
Gastrophryne carolinensis	*	
Hyla chrysoscelis	*	*
Lithobates catesbeianus	*	*
Lithobates clamitans	*	*
Lithobates palustris	*	*
Lithobates sylvaticus	*	*
Pseudacris crucifer	*	
Pseudacris feriarum	*	*
Ambystoma maculatum		*
Aneides aeneus	*	*
Eurycea cirrigera		*
Eurycea l. longicauda	*	*
Eurycea lucifuga	*	*
Notophthalmus v. viridescens		*
Plethodon glutinosus	*	*
Plethodon kentucki	*	*
Pseudotriton r. ruber		*
Reptiles		
Graptemys geographica		*
Terrapene c. carolina	*	*
Plestiodon fasciatus	*	*
Sceloporus undulatus	*	*
Scincella lateralis		*
Carphophis a. amoenus	*	*
Coluber c. constrictor		*
Diadophis punctatus edwardsii	*	*
Heterodon platirhinos	*	
Lampropeltis nigra	*	*
Nerodia s. sipedon	*	
Pantherophis alleghaniensis	*	*
Virginia v. valeriae		*

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Eastern Spadefoots in Virginia: Observations Made from Volunteer Herpetologists Around the State.

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Abstract: The Eastern Spadefoot is a secretive, fossorial, and explosive breeding frog for which much of its ecology and distribution is still relatively unknown in Virginia. For the past two and a half years we have collected distributional and phenological data on the Eastern Spadefoot from 58 volunteer herpetologists from around the state. Data collected includes activity dates, geographic locations, habitat associations, and other natural history information. The earliest recorded activity for spadefoots in Virginia was 12 January and the latest was 26 December. Spadefoot activity was observed in every month except March and November. The months of May and June had the largest frequency of spadefoot activity. Chorusing males were reported from 25 February to 8 September; May and June had the highest frequency of reported calling observations. We report 8 new county records, 1 new city record, and 24 confirmation county records for this species. One volunteer observed a domestic cat attacking a spadefoot and another volunteer observed an Eastern Hog-nosed snake preying on an Eastern Spadefoot. There is much that remains to be known about this species.

Key Words: *Scaphiopus holbrookii*, Biogeography, Phenology, Deformity, Domestic Cat, Citizen Science

INTRODUCTION

The Eastern Spadefoot is a medium sized frog characterized by two small round parotoid glands, vertical pupils, two yellow or white colored dorsal stripes, and cornified metatarsal tubercles on the bottom of each hind foot (Figure 1). The dorsum of this frog has numerous granular glands, many being reddish in coloration and the ventrum has a pair of granular pectoral glands. The cornified metatarsal tubercles are used to create a burrow or series of burrows which it uses for concealment. The spadefoot is

philopatric to these burrows and has an established home range of 8 - 10 m^2 (Pearson, 1955). Pearson (1955) found Eastern Spadefoots to be nocturnal and active only 29 nights a year in Florida. Breeding is triggered by substantial rain events and occurs in temporary wetlands. Reproduction is nocturnal and, in some years, may not occur at all. This collection of unique characteristics makes the spadefoot a rare frog to find.

Figure 1. Photograph of male Eastern Spadefoot.

The Virginia Department of Game and Inland Fisheries wildlife action plan rating for this species is Tier IVc. This rating means that there is moderate conservation needs and the managers have failed to identify "on the ground" actions or research needs that could benefit the species (Sevin and Kleopfer, 2015). Eastern Spadefoots were first documented for Virginia in 1916 (Fowler, 1918). It took another 11 years for the second record of this species to be found and recorded in 1927 (Trautman, 1931). Merkle (1977) was the first to publish a map of Eastern Spadefoots in Virginia. His map plotted spadefoots collected between 1916 and 1977. In total, only 13 records were recorded on his map. At that time most records came from frogs found in the coastal plain and ridge and valley physiographic provinces. By 1985, Tobey (1985) plotted 29 records for Eastern Spadefoots in the first herp atlas he compiled. Mitchell and Reay (1999) plotted 63 spadefoot locations in their herp atlas. Currently, there are 46 counties and cities with records of spadefoots and the most current and accurate map available is archived on the Virginia Herpetological Society's website (Figure 2, accessed 13 August 2019). This map includes records from Mitchell and Reay (1999), the Virginia Fish and Wildlife Information Service and records published in Catesbieana and Herpetological Review.

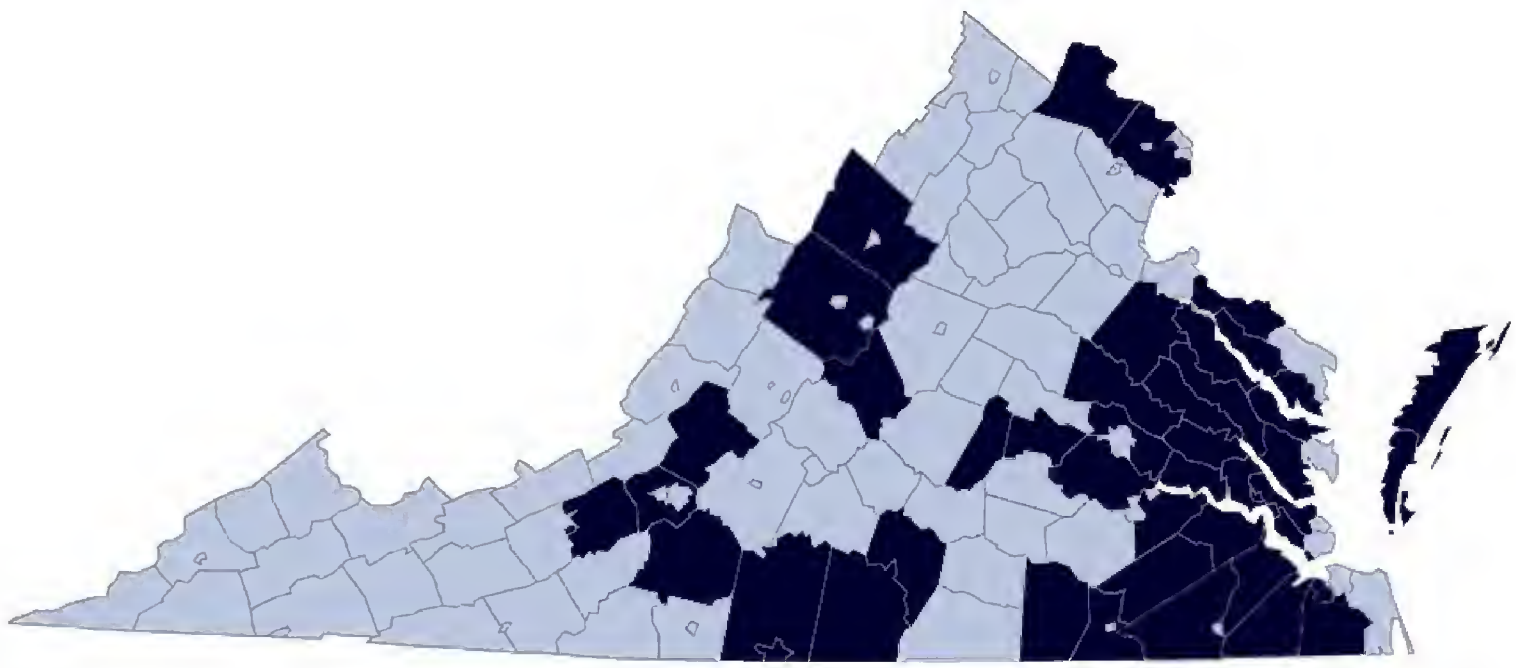

Figure 2. Most current county record map for Eastern Spadefoots in Virginia subsequent to this study. (Accessed 13 August 2019 https://www.virginiaherpetologicalsociety.com/amphibians/frogsandtoads/eastern-spadefoot/eastern_spadefoot.php)

There is still a lot to be known about Eastern Spadefoots in Virginia. The biogeography of this species is still largely unknown, especially in the piedmont and western part of the state. The phenology of this species is also lacking many records for our state (Church, et. al., 2002; Sattler and Gibson, 2007; Gibson and Sattler, 2010). The purpose of this paper is to shed more light on the distribution and natural history of this animal.

MATERIALS AND METHODS

In order to gain a better understanding of the natural history and geographic distribution of this species, we enlisted the help of volunteer herpetologists around the state. To do this we designed and deployed an Eastern Spadefoot wanted poster (Figure 3). Our hope was to stimulate the herping community to share distributional and phenological data which would help fill some of the gaps in our knowledge of this species. The poster had a simple description of the Eastern Spadefoot, suggestions on where they might be found, an explanation of why we were conducting this project, and contact information for sending in observations. We advertised this wanted poster on the Virginia Herpetological Society's Facebook page. Additionally, John White (the VHS webmaster) created a spadefoot reporting link on the homepage of the VHS website. The wanted poster was also posted on the homepage of the Virginia Master Naturalists website. Over the course of this two-and-a-half-year project we answered more than 70 emails. For each email received we followed up thanking the individual and asked questions for clarification of the observation. Table 1 includes the date of observation, location, and observer name for each person submitting data for this project.

Have you seen an Eastern Spadefoot?
Why are we interested in this frog?
Very little is known about the distribution and habits of this species in Virginia. We think this frog is more common and more widespread than what is currently known. This is why we are asking for your help in increasing our knowledge about this secretive frog.
Identifying characteristics include:
Vertical oriented pupils
Brownish colored body (the color is highly variable)
Two yellow lines running along the back
2-3 inches long
For more pictures of Eastern Spadefoots and and look-alike toads visit the VHS website http://www.virginiaherpetologicalsociety.com/
Places to look
Roads near wetlands
Vernal pools (temporary bodies of water which dry up by the end of the summer)
Ditches
Swimming pools
Flooded agricultural fields
When to look
After heavy rains, perhaps during any month of the year.
How can you assist in this project?
If you see, hear, or make any observation of an Eastern Spadefoot, then take several digital photos of it from a side view and a back view. You may also digitally record it calling. Please send digital photos, recordings, or any observation (including location information) to:
Jason Gibson
Patrick Henry Community College
jdgibson@patrickhenry.edu
Travis Anthony
Reynolds Community College
tanthony@reynolds.edu
Patrick HENRY Community College
Reynolds COMMUNITY COLLEGE
This project is a collaborative project of Patrick Henry Community College, Reynolds Community College, the Virginia Herpetological Society, and the Virginia Department of Game and Inland Fisheries.

Figure 3. Eastern Spadefoot wanted poster.

Table 1. Data collected from participants. Organized alphabetically by county.

Name of the observer	County/City	Date of observation	VHS Archive Number	Count Record or Confirmation	Location
Brenda Poist	Accomack Co.	6/3/18		Confirmation	No location given
Paula Valentine	Accomack Co.	5/18/18		Confirmation	37.5618198, -75.8456031
Steven Johnson	Augusta Co.	10/8/16		Confirmation	37.9769093, -78.9964692
Kyle Harris	Bedford Co.	No date given		County Record	37.3718966, -79.4978535
Justin Reed	Bedford Co	No date given		County Record	No location given
Patricia Conner	Campbell Co.	February 2013		Confirmation	37.1147972, -79.2943383
Lauri Schular	Campbell Co.	12/26/15		Confirmation	37.334831, -78.9823247
Logan McDonald	Caroline Co.	5/18, 6/9, 6/26/15		Confirmation	38.0718281, -77.3301741
David Steinberger	Caroline Co.	6/3/18		Confirmation	38.1424211, -77.4416129
David Steinberger	Caroline Co.	7/25/19		Confirmation	38.0540955, -77.5256415
Karen Daniel	Chesterfield Co.	2/24/17		Confirmation	37.2482169, -77.4716407
Blake Neace	Chesterfield Co.	9/3/18		Confirmation	37.2361852, -77.4996975
Belinda Burwell	Clark Co.	No date given	531	County Record	39.062522, -78.003684
Liam McGranaghan	Clark Co.	5/15/14, 5/16/14, 5/27/15	532	County Record	Location withheld at request of observer.
Robert Simpson	Clark Co.	No date given		Confirmation	No location given
Joe Barron	Culpeper Co.	8/23/17		*County Record	38.5912, -77.9702
Seth Honsinger	Culpeper Co.	5/19/18		Confirmation	38.4639, -77.7859
Cher Brown	Cumberland Co.	7/10/18		Confirmation	37.657367, -78.226969
Dustin Branch	Dinwiddie Co.	6/6/16	530	County Record	37.1321893, -77.4555315
Matthew Ratcliffe	Fairfax Co.	4/29		Confirmation	38.769219, -77.237418
Matthew Ratcliffe	Fairfax Co.	5/12		Confirmation	38.769219, -77.237418
Jeromy Shaffer	Frederick Co.	8/23/18	537	County record	39.195862, -78.3491797
Ned Rose	Gloucester Co.	4/8/19		Confirmation	37.4338564, -76.5990316
Travis Anthony	Hanover Co.	6/8/19		Confirmation	37.5758972, -77.3020324
Natalie Cavalieri	Hanover Co.	5/9/19		Confirmation	37.876478, -77.5395937
David Kuhn	Hanover Co.	No date given		Confirmation	37.7854805, -77.5364122
Constance Lumpkin	Hanover Co.	10/2/18		Confirmation	37.7427801, -77.4124142
David Medici	Hanover Co.	5/18/18		Confirmation	37.7530027, -77.5000559
Catharine Tucker	Hanover Co.	7/25/18		Confirmation	37.733312, -77.3574737
Sandra Marr	Henrico Co.	9/24/18		Confirmation	37.5805015, -77.5891548
Jeff Parks	Henrico Co.	2015		Confirmation	37.4434989, -77.3712166
Jeff Parks	Henrico Co.	5/28/18		Confirmation	37.4419656, -77.3705879
Robert Wright	Henrico Co.	5/12/17		Confirmation	37.6407846, -77.3541727
Terri Cuthriell	Isle of Wight Co.	6/25/15		Confirmation	37.017349, -76.629432 and 37.027412, -76.644624
Laurel Harrington	Isle of Wight Co.	No date given		Confirmation	36.851244, -76.6827497
Courtney Check	James City Co.	6/12/17		Confirmation	No location given
Glenn Glass	James City Co.	7-7-19		Confirmation	37.2684158, -76.75728
Roger Gosden	James City Co.	5/31/16		Confirmation	37.255922, -76.748390
J.D. Kleopfer	James City Co.	7/30/18		Confirmaton	37.2204827, -76.7674812
Susan Yager	James City Co.	7/6/18		Confirmation	37.3986, -76.7489
Dean and Andrew Thompson	King George Co.	6/3/18	535	County Record	38.2215178, -77.1198413
Brian Munford	King William Co.	2/25/16		Confirmation	37.6687633, -77.2656145
Corrie Grimm	Lancaster Co.	6/2/18		Confirmation	No location given
Ty Smith	Lunenburg Co.	6-19-19	539	County Record	37.019086, -78.268606
Brent Cannon	Mathews Co.	7/23/18	536	County record	37.44789, -76.31899
Cindy Andrews	Middlesex Co.	8/4/18, 4/24/19		Confirmation	37.5298048, -76.4302231
Melissa Sayers	Newport News	6/4/15		Confirmation	37.1904687, -76.5503314
Christopher Bache	Northumberland Co.	No date given		Confirmation	37.954418, -76.390709
Elizabeth Gruben	Northumberland Co.	5/18/18		Confirmation	37.7441857, -76.3503448
Mike Clifford	Nottoway Co.	No date given		County record	37.20745, -78.16794
Robert Trench	Nottoway Co.	4/29/18	534	County Record	37.0098853, -77.9331829
Jackie Hall	Page Co.	6/3/18		Confirmation	38.618679, -78.4879128
Henry Molina	Page Co.	2014		Confirmation	No location given
Bill Barham	Pittsylvania Co.	5/2016		Confirmation	No location given
Hunter Young	Rockbridge Co.	12/18/17	533	County Record	37.74205, -79.3395
Maggie McCartney	Rockingham Co.	6/22/18		Confirmation	38.3737022, -78.6802552
Brian Munford	Southampton Co.	9/8/11		Confirmation	36.7936629, -77.1320877
Timmy Songer	Sussex Co.	1/12/18		Confirmation	36.8632277, -77.1880269
Katharina Bergdoll	Westmoreland Co.	10/8/18		Confirmation	38.0922301, -76.6660378
Troy Floyd	City of Richmond	7/7/19	540	City Record	37.4831299, -77.4894117

*Observer published this observation in Herp Review

We screened each possible county record against the Tobey atlas (1985), the Herp Atlas (Mitchell and Reay, 1999), the VHS species database, the Department of Game and Inland Fisheries VA Fish and Wildlife Information Service (VAFWIS), Vertnet.org, museum records from the Virginia Museum of Natural History, and the published

fieldnotes in Catesbeiana, and records in Herpetological Review.

RESULTS

From January 2017 until July 2019 we received more than 70 emails and Facebook messages regarding Eastern Spadefoot observations. Around a dozen of the submissions received reported old unpublished observations. The rest of the submission were reporting new observations. Fifty-eight people contributed data to this project (Please see the acknowledgement section at the end of this paper for a full listing of contributors). The earliest reported spadefoot observation was 12 January 2018 in Sussex County and the latest was 26 December 2015 in Campbell County. Observations were reported for every month except March and November. The months of May and June had the highest reported spadefoot observations (Figure 4). Eastern Spadefoots were reported calling from 25 February to 8 September (Brain Munford, personal communication) with May and June having the highest frequency of calling observations (Figure 5).

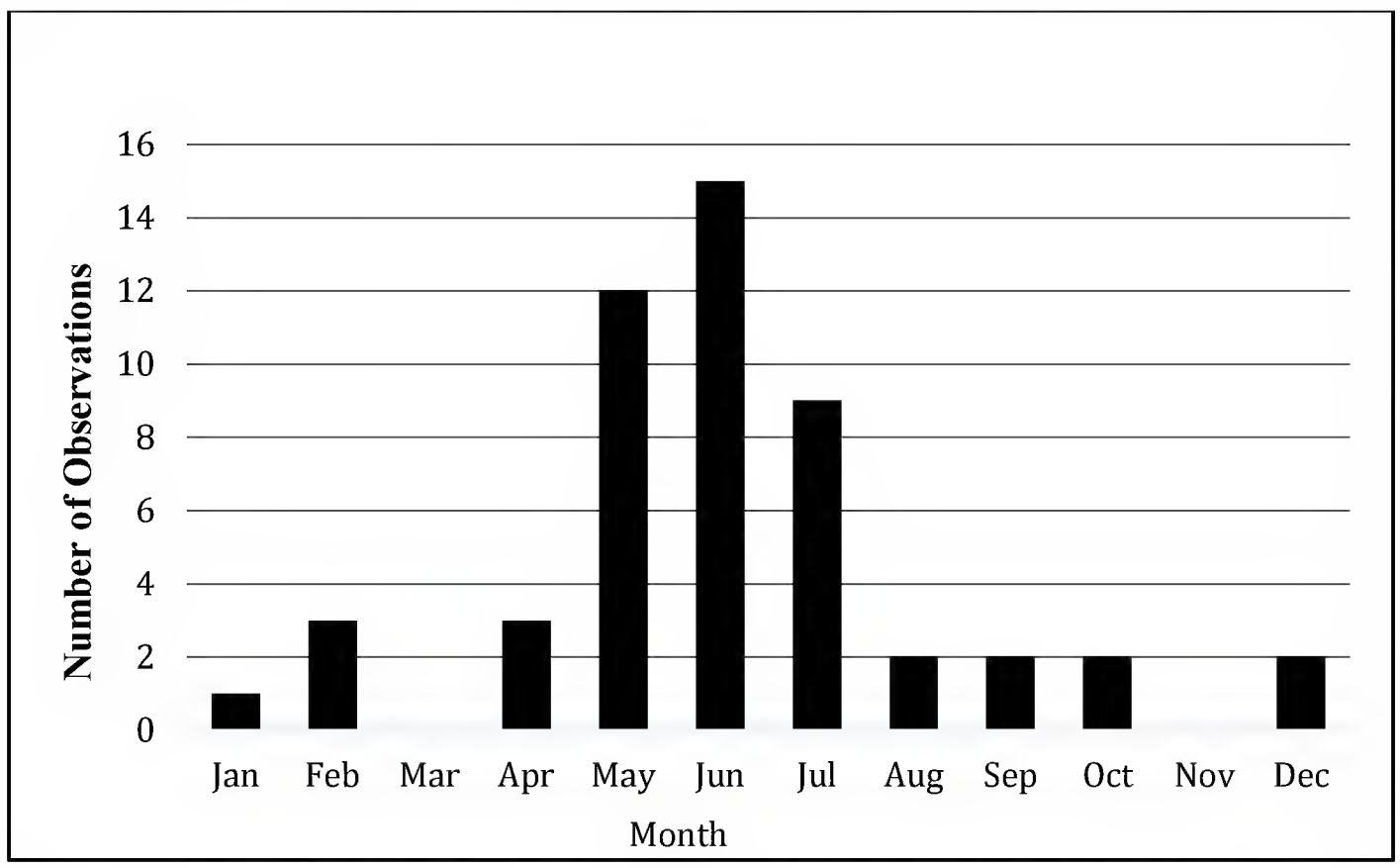

Figure 4. Reported spadefoot observations by month.

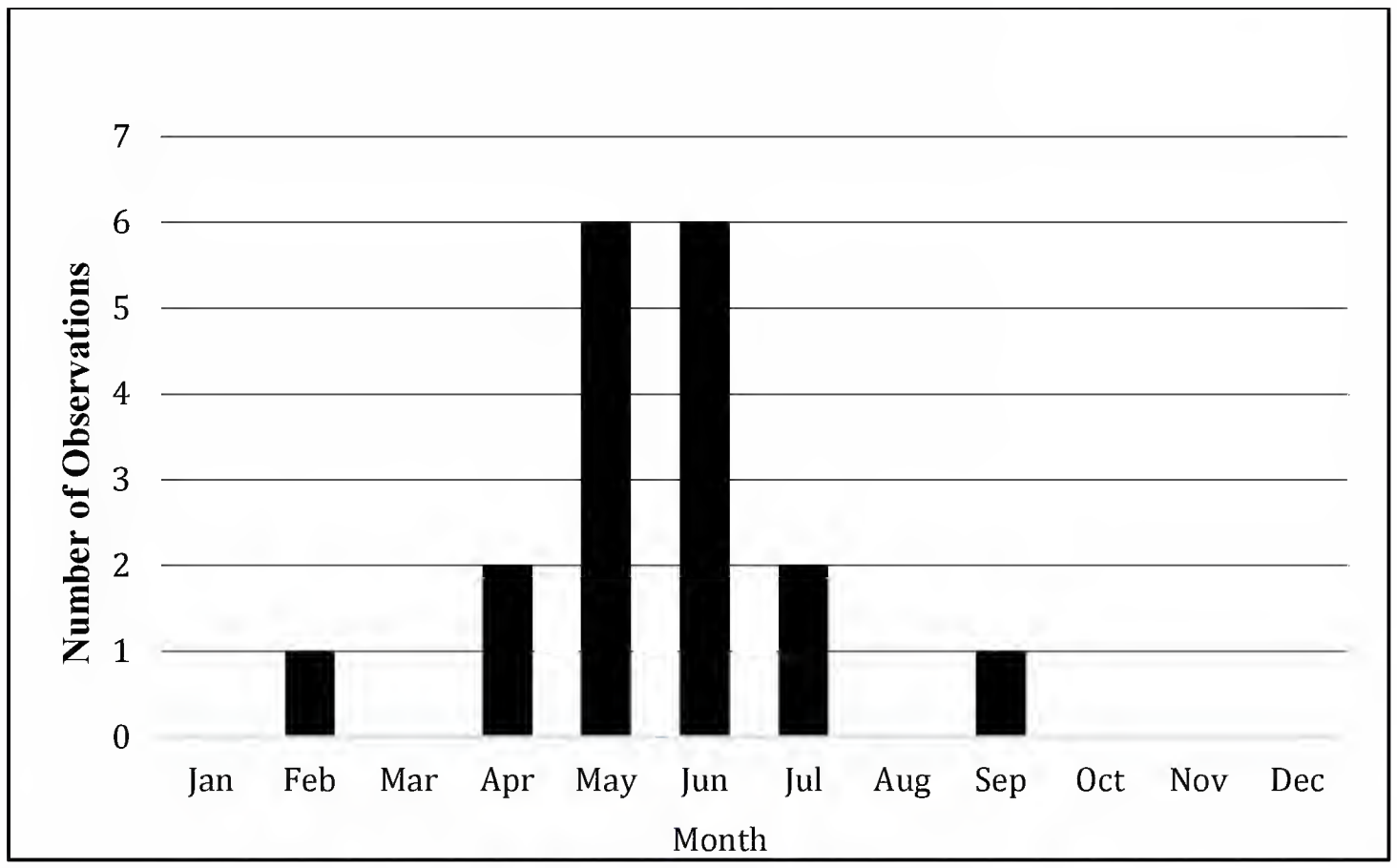

Figure 5. Frequency of calling spadefoots by month.

People reported finding spadefoots in vernal pools, alive on roads (AOR), in old and active swimming pools, in a flooded agricultural field, on baseball and soccer fields, on driveways, in residential yards, in soil, in a well house, and one was reported 10 feet underground in an underground stormwater vault (Figure 6).

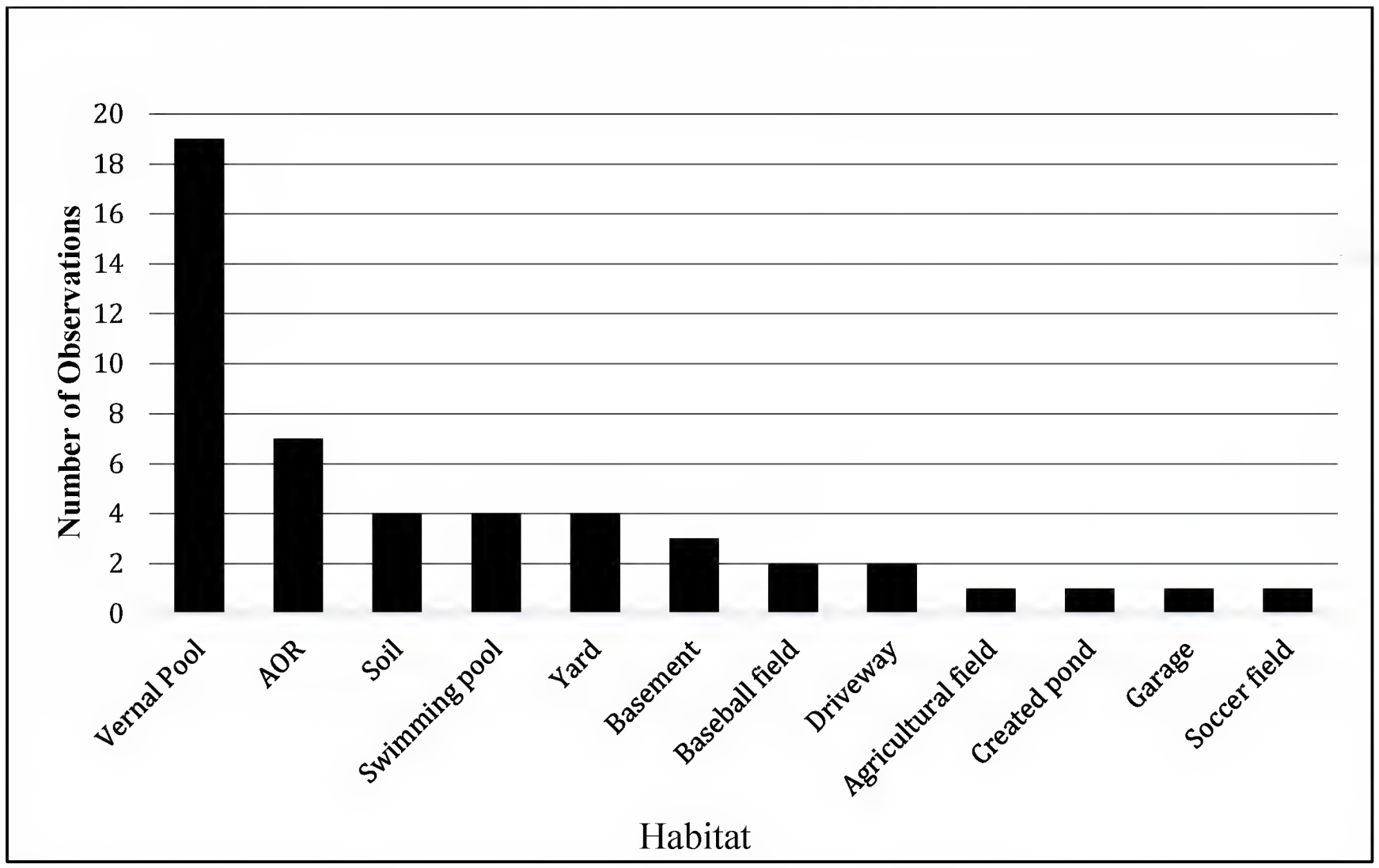

Figure 6. Frequency of spadefoot observations by reported habitat.

Eight county records and one city record (City of Richmond) were vouchered with digital photos (see Table 1 for the VHS photo archive numbers). In addition, two people reported finding spadefoots in two different locations in Bedford County but neither submitted photos. Tobey (1985) included a record for spadefoots in Bedford County, but neither Mitchel and Reay (1999) or the VHS website report any records for this species in this county. The observations made in Bedford County thus serves as a confirmation to what was reported by Tobey. We also report 24 confirmation county and city records collected during the survey time period. For many of these counties this is only the second record ever reported. See Figure 7 for a map of the new county records and confirmation county records.

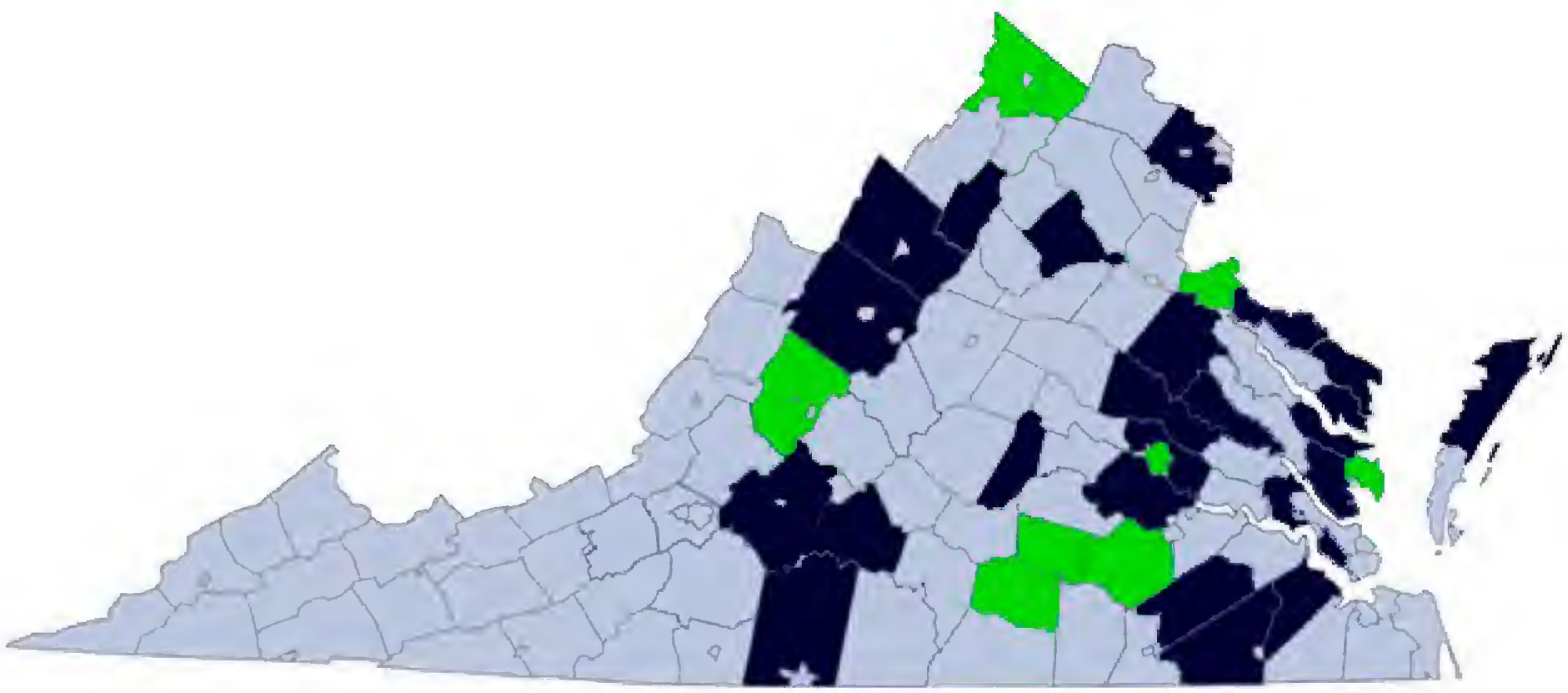

Figure 7. Map showing new county records (green) and county record confirmations (blue) collected during this study.

Injuries, malformations, or deformations such as reported here are generally lacking for this species (Palis, 2005; Dodd, 2013). One frog was reported with a front foot with only two digits (Figure 8). Another contributor reported an Eastern Spadefoot being eaten by an Eastern Hog-nosed Snake. This is not a new observation but rather confirms what was reported for the diet of this snake in Mitchell (1994). There was even a report from the Wildlife Center of Virginia of a domesticated cat attacking an adult Eastern Spadefoot. The spadefoot did survive the attack and was released at the site of capture.

Figure 8. Eastern Spadefoot with only 2 digits (Photo taken by Susie Yagar)

DICUSSION

Within this account, we were able to report observations on Eastern Spadefoots from around Virginia from 58 participants. The use of a wanted poster published on the VHS website led to 9 new county/city records and 24 confirmation county records within a two-and-a-half-year period. Two additional county records in Culpeper County and Fauquier County were reported to us; the submitter decided to publish his results separately in Herp Review (Barron et al., 2018). Early and late dates of activity, activity frequency and calling frequency, habitat associations, and a few additional natural history observations were recorded. The late activity date of 26 December reported here does not appear to be the latest date for Virginia. A museum specimen (VMNH - HER 6148) was collected on 27 December 1986 in Isle of White County. This appears to be the latest date of activity for the spadefoot in Virginia.

In the process of confirming our county records we discovered several museum records for Campbell County (USNM 529918 – USNM 529921), Northumberland County (NCSM-Herp 70783), Mecklenburg County (VMNH - HER 6807), and the city of Hopewell (CM-Herps 34035) which do not appear in Tobey (1985), Mitchell and Reay (1999), nor the VHS Eastern Spadefoot species map. We did confirm the presence of spadefoots in Campbell and Northumberland Counties in this study.

One common trend we noticed in the reported data was the proximity of finding spadefoots near large streams and rivers. Of 52 reported locations 20 (38%) were found within 1.6 km of large streams or rivers (average distance = .67 km, min .13 – max 1.62, n = 20). Spadefoots need soft pliable soil in order to dig burrows and thus are likely to be found near floodplain river corridors where these types of soils are common. These floodplains appear to be important to this species by allowing them the right habitat to allow for migration into the interior of the state. One puzzling aspect of spadefoot distribution is the lack of piedmont records. By viewing the most current map (Figure 9) this observation becomes readily apparent.

Eastern Spadefoot Toads in Virginia

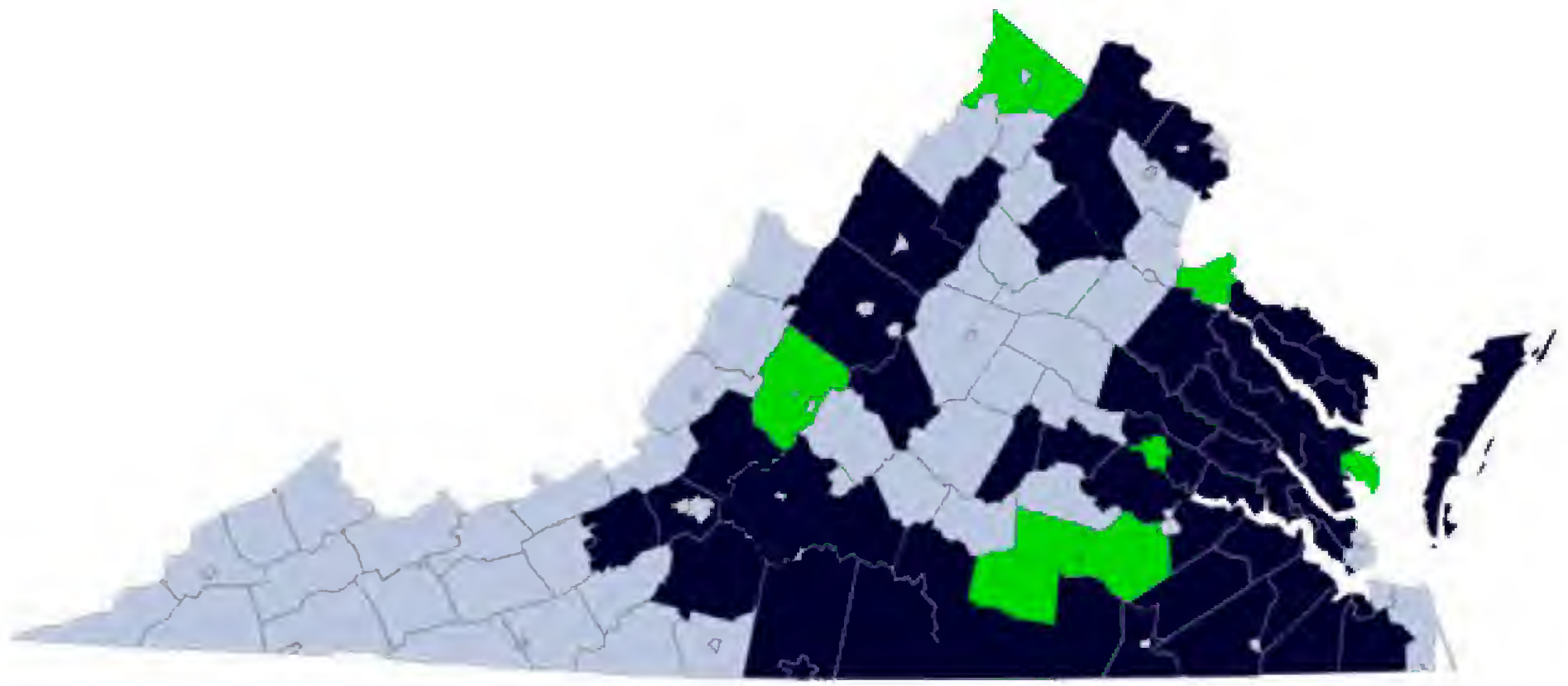

Figure 9. The most current county record map of Eastern Spadefoots in Virginia.

There is no discernable reason why this species is not found in every piedmont county. For every major river watershed, excluding the ones found in the extreme western part of the state, there are spadefoot records for both the coastal plain and the ridge and valley provinces. According to their habitat requirements, spadefoots should occupy floodplain areas in between. The lack of piedmont county records is most likely due to the secretive nature of this frog and the lack of people looking in these counties. Searching for spadefoots on the road and listening for spadefoot breeding choruses in places with vernal pools and within the floodplains of major watersheds during the months of May and June will most likely begin to yield new piedmont county records. Surveys around vernal pools in the summer months may also reveal the presence of this species since its metamorphs are more active on the surface than adults.

More work needs to be done. We have very little or no knowledge on spadefoot parasites, prey, diseases, egg laying dates, number of eggs laid per season, and the impact humans are having on this species (Palis, 2005; Dodd, 2013). We plan to continue this project in the hopes that we will gain a better understanding of where this species is located and other aspects of this species' natural history. In order to better understand this species one person cannot do all the work. We strongly encourage anyone with unpublished information on this species to please publish your data. To quote Joe Mitchell, "if it isn't published then it never happened."

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Virginia Herpetological Society 2018 Annual Spring Survey
Lake Anna State Park in Spotsylvania County, Virginia

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Abstract: Lake Anna State Park is a 1,200 hectare park in Spotsylvania County with wetlands, woodland habitats, and open fields. It was surveyed 6 May 2018 for the pre-survey and 19-20 May 2018 for the main survey by approximately 70 volunteers. There were 445 individuals of 38 species of herpetofauna documented (19 amphibians and 19 reptiles) including 10 new records for Spotsylvania County. Of the 38 species documented, two were Virginia Department of Game and Inland Fisheries Tier IIIa and Tier IVa species, the Woodland Box Turtle and Common Ribbonsnake respectively. Future surveys of the park could uncover an additional 17 new species for Spotsylvania county.

Key Words: Herpetological Survey, Lake Anna State Park, Spotsylvania County, VDGIF Tier IIIa, VDGIF Tier IVa, Woodland Box Turtle, Common Ribbonsnake

INTRODUCTION

The Virginia Herpetological Society (VHS) 2018 Annual Spring Survey was held at Lake Anna State Park in Spotsylvania County, Virginia. This was the first time the VHS had conducted a survey in Spotsylvania County. Lake Anna State Park is over 1,200 hectares (2,965 acres) and there were several different types of habitats: creeks, large ponds, lakes, open field, edge habitats, and forests. The park is located in the Piedmont province of Virginia (Tobey, 1985) which is defined by upland forests, well-drained soils, and rolling hills (Mitchell and Reay, 1999). Lake Anna State Park has an interesting past. It opened as a state park in 1983, but before then was known for different reasons (Maurer, 2013). The lake was created in 1971 as a source for cooling water for a nearby power plant (Maurer, 2013). Previously, the area was known as Gold Hill when gold was discovered in the early 1800's. Mining activity continued until the early 1900's (Maurer, 2013). Currently the park has heavy recreation use centered around the lake with camping sites and 24 kilometers (>14 miles) of hiking trails.

Lake Anna State Park was selected because the VHS had not previously conducted a survey within Spotsylvania County. Another reason Lake Anna State Park was selected was due to many potential county records that might be documented there. In addition to the 37 species that had previously been documented in Spotsylvania County (VHS database) it was estimated up to 27 more could be documented, if animals that were found in nearby counties are an indicator. The multitude of different habitats (aquatic, open fields, and upland forest habitats) would potentially help maximize the number of herp species encountered.

Survey Sites
The study sites for the VHS 2018 Annual Spring Survey at Lake Anna State Park are listed below and can be seen in Figure 1.

Site 1 (and P2 on the pre-survey) – Fisherman's Trail (38° 7' 4.8"N, 77° 50' 14.5"W)
Fisherman's Trail started at the picnic area and followed the social trail adjacent to Lake Anna. The trail eventually headed off to higher ground away from the water and included mostly woodland habitat.

Site 2 (and P1 on the pre-survey) – Sawtooth Trail (38° 6' 59.8"N, 77° 49' 8.0"W)
This site started at the Trailhead of Sawtooth Trail and headed south towards Glenora Trail. The habitat was a mix of woodland with some wetlands.

Site 3 – Mill Pond Trail (38° 6' 59.8"N, 77° 49' 8.0"W)
This site started at the Trailhead of Mill Pond Trail (across the street from the Sawtooth Trailhead) and headed north towards Pigeon Run Trail. The habitat was woodland mixed with some wetland.

Site 4 – Old Log Road (38° 8' 21.0"N, 77° 48' 53.7"W)
This site started just through the gate of the Old Log Road. The northern most end included the Gold Hill Trail. The habitat was a mix of hardwood forest.

Site 5 – Ware Field (Forest) (38° 7' 53.2"N, 77° 50' 22.3"W)
This site is not publicly accessible. It was recently obtained by Lake Anna State Park and is disjunct from the main area of the park. The site started just through the gate off of Purcell Lane and the habitat surveyed was woodland forest.

Site 6 – Ware Field (Field) (38° 7' 20.3"N, 77° 50' 26.1"W)
This site is also in the recently obtained land disjunct from the main area of Lake Anna State Park. This area started next to a fenced cemetery and included open field and edge habitat as well as habitat along the shore of Lake Anna.

Site 7 – Old Pond Trail and Beach (38°06'43.1"N, 77°49'54.0"W)
This site started at the beginning of Old Pond Trail and looped around to the beach. This was primarily water edge habitat of Old Pond as well as flooded areas on the beach of Lake Anna.

Site 8 (and P3 on the pre-survey) – Railroad Ford Trail (38°06'44.7"N, 77°49'49.0"W)
This site started at the end of the Old Pond Trail and included streams, seeps, and vernal pools in a woodland habitat.

Site 9 – Glenora Trail (38°06'36.1"N, 77°49'33.8"W)
This site started at the Glenora Trail trailhead, near the campsites, and headed southeast towards the Big Woods Trail. The habitat at this site was primarily woodland with many streams.

Site 10 – Power lines (38°08'22.3"N, 77°48'55.3"W)
This area started at the parking area through the main entrance gate and continued southeast along the power lines. The habitat was primarily edge habitat between field and woodland.

Site 11 – Forest adjacent to Power lines (38°08'22.6"N, 77°49'01.4"W)
The survey area started at the parking area of the park maintenance area and headed south into the wooded area between the power lines and the main park road.

Figure 1. Map showing area surrounding Lake Anna State Park and survey sites at the park

METHODS

For the pre-survey on Sunday, 6 May 2018 survey participants were split into two groups in the morning and combined to form one in the afternoon. For the main survey on Saturday, 19 May and Sunday, 20 May 2018 participants were split into 11 groups. Prior to surveying, participants disinfected footwear and snake hooks in either a Novalsan or 10% bleach solution. Methods used to find animals included hand capture, visual observation, listening for calling anurans, turtle traps, nets, and flipping over cover objects. All animals that could be photographed as voucher specimens were and animals with signs of disease or injury were especially noted. Group leaders completed survey data sheets to record all animals encountered on standardized sheets. Data sheets included information on: the physical environment, weather, animal health, and microhabitat. Other data collected included morphometric measurements of rare species, age, and sex. On Sunday, 6 May the temperature ranged from 18.3°C to 22.8°C with an overcast sky. On Saturday, 19 May the temperature ranged from 15.6°C to 21.1°C with rain throughout the day. On Sunday, 20 May the temperature was 22.8°C to 25.6°C with partly sunny to sunny skies. There was a total of 419.5 person hours per survey effort between all of the survey dates - 35.5 person hours during the pre-survey (Table 1), 286.5 person hours on Saturday 19 May (Table 2), and 97.5 person hours on Sunday, May 20 (Table 3).

Table 1. Summary of Survey effort per site on Sunday, 6 May 2018.

Survey Site	No. of Surveyors	Hours	Estimated Person Hours
P1	4	2.25	9
P2	4	2.5	10
P3	6	2.75	16.5
Sub-Total			35.5

Table 2. Summary of Survey effort per site on Saturday, 19 May 2018.

Survey Site	No. of Surveyors	Hours	Estimated Person Hours
1	4	4.75	19
2	8	6	48
3	9	6	54
4	11	5	55
5	9	4	36
6	10	4	40
7	23	1.5	34.5
Sub-Total			286.5

Table 3. Summary of Survey effort per site on Sunday, 20 May 2018.

Survey Site	No. of Surveyors	Hours	Estimated Person Hours
8	6	3.25	19.5
9	8	3	24
10	16	3	48
11	2	3	6
Sub-Total			97.5

Results

The pre-survey of Lake Anna State Park was conducted Sunday, 6 May 2018. There were eight people in attendance and sites P1, P2 and P3 were surveyed. There were 51 individual animals of 20 species of herpetofauna (9 amphibians and 11 reptiles) recorded, including 5 new county records: *Hemidactylium scutatum, Pseudacris feriarum, Coluber constrictor constrictor, Plestiodon inexpectatus,* and *Plestiodon laticeps*. On the Annual Spring Survey conducted on Saturday, 19 May and Sunday, 20 May 2018 there were 62 people in attendance and sites 1 to 11 were surveyed. There were 394 individual animals of 33

Table 4. Summary of the number of amphibians observed at each site.

Species/Site	P1	P2	P3	1	2	3	4	5	6	7	8	9	10	11	Total
Acris crepitans	8	2	10		3	6		5		1	5	7	8		55
Ambystoma maculatum	1														1
Ambystoma opacum	2		1		1						1	3	1		9
Ambystoma sp.												1			1
Anaxyrus a. americanus					2		3		4	10			1		20
Anaxyrus fowleri									1	1			1		3
Desmognathus fuscus											1		1		2
Eurycea cirrigera			5				1				3	2			11
Hemidactylium scutatum	2														2
Hyla chrysoscelis				1						100	6				107
Hyla versicolor										50	1				51
Lithobates clamitans			1	1		2				7	1				12
Lithobates palustris										2					2
Lithobates sylvatica						1									1
Notophalamus v. viridescens						2	2		1	3	2	1			11
Plethodon cinereus			3			6	7	1				2			19
Plethodon cylindraceous	2						1		1		1				5
Pseudacris crucifer				2	1				1						4
Pseudacris feriarum	2			1								4			7
Pseudotriton r. ruber							3				2			1	6
Total	17	2	20	5	7	17	17	6	8	174	23	20	12	1	329

Table 5. Summary of the number of reptiles observed at each site.

Species/Site	P1	P2	P3	1	2	3	4	5	6	7	8	9	10	11	Total
Agkistrodon c. contortrix														1	1
Carphophis amoenus		1	1	1	6	5	2	3	2		2	4	2		29
Chelydra serpentina										1	3				4
Chrysemys p. picta											2		1		3
Coluber c. constrictor		1											2		3
Diadophis punctatus edwardsii							3		1						4
Nerodia s. sipedon						1				7			2		10
Pantherophis alleghaniensis														1	1
Plestiodon sp.					1				1		1	2	6		11
Plestiodon fasciatus	1					1	1							1	4
Plestiodon inexpectatus		1													1
Plestiodon laticeps		1											2		3
Sceloporus undulates	1											3	1		5
Scincella lateralis		1													1
Storeria occipitomaculata		1			1		1								3
Terrapene c. carolina		1			2	3	2	2			4	2	8	3	27
Thamnophis s. sauritus													1		1
Tracemys scripta elegans										1	2				3
Virginia v. valeriae			1												1
Total	2	7	3	1	10	9	9	5	4	9	14	11	26	6	116

species of herpetofauna (17 amphibians and 16 reptiles) recorded, including 5 new county records: *Desmognathus fuscus, Lithobates sylvaticus, Pseudotriton ruber ruber, Thamnophis sauritus sauritus,* and *Trachemys scripta elegans*. Between both surveys, 445 individuals of 38 species of herpetofauna were recorded – 19 amphibians (Table 4) and 19 reptiles (Table 5).

Annotated Checklist

Note: for the accounts below numbers in parentheses are animals accounted for at each site listed

Amphibians

1. Acris crepitans (Eastern Cricket Frog) Fifty-five *A. crepitans* were found across 10 survey sites. They were found either in or close to an aquatic habitat – on the bank of a seep, creek, or pond – at sites: P1 (8), 2 (3), 5 (5), 7 (1), 8 (5), 9 (7), and 10 (8). The remaining individuals were found in lowland habitats away from water at sites: P2 (2), P3 (10), and 3 (6).

2. *Ambystoma maculatum* (Spotted Salamander) One *A. maculatum* was found under a log in a woodland habitat at site P1.

3. *Ambystoma opacum* (Marbled Salamander) Ten *A. opacum* were found across six sites. They were found under logs in woodland habitats at sites P1 (2), P3 (1), 2 (1), 8 (1), and 9 (3). A single unidentified *Ambystoma spp.* was documented. It was found under a log at site 9 in a woodland habitat. It could likely be a Marbled Salamander due to three other individuals being found at site 9, but it was not verified when it was documented.

4. Anaxyrus americanus americanus (Eastern American Toad) There were 20 *A. a. americanus* found across 5 sites. At site 2 two individuals were found, one on the ground in leaf litter and the other on a creek bank. At site 4 three individuals were found, one in a stump and the other two in close proximity to the stream. At site 7, 10 were heard calling around the vernal pools of the flooded beach area. At site 10 a single *A. a. americanus* was seen at the edge habitat of a power line cut and forest.

5. Anaxyrus fowleri (Fowler's Toad) There were three *A. fowleri* found across 3 sites: 6, 7, and 10. At sites 6 and 10 they were seen at edge habitats of open area and forest. At site 7 they were heard calling around the flooded beach vernal pool areas.

6. *Desmognathus fuscus* (Northern Dusky Salamander) There were two *D. fuscus* found at sites 8 and 10. Both individuals were found in a stream in a woodland habitat. This was the first time that *D. fuscus* had been verified in Spotsylvania County and this photo was submitted as a voucher (VHS Archives #208).

7. *Eurycea cirrigera* (Southern Two-lined Salamander) Eleven *E. cirrigera* were found across four sites. At sites P3 (3) and 8 (2), they were found in a seep or stream. At sites 4 (1) and 8 (2) there were found under a log away from water. An interesting note, on the pre-survey at site P3 over 80 eggs were guarded by 2 female *E. cirrigera* within 10 meters of each other.

8. Hemidactylium scutatum (Four-toed Salamander) Two *H. scutatum* were found at site P1. Both individuals were juveniles no longer than 5 cm (2 inches). One was found under a log in a woodland forest away from water and another was found in sphagnum moss near a vernal pool. This was the first time that the Four-toed Salamander had been documented in Spotsylvania County and a photo was entered into the archives (VHS Archives #209).

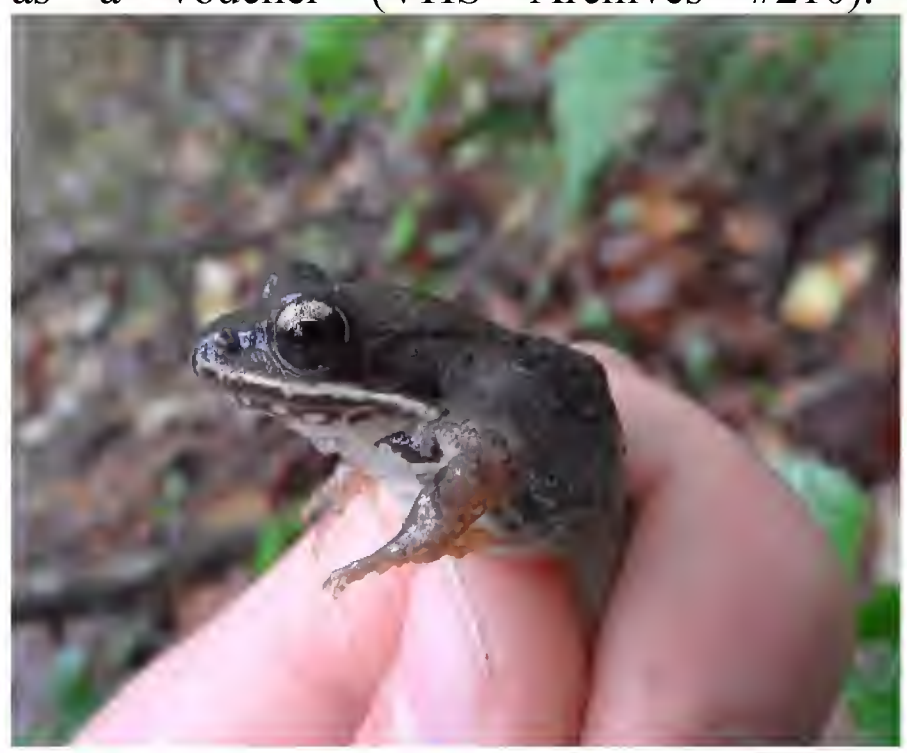
9. *Hyla chrysoscelis* (Cope's Gray Treefrog) The most abundant animal found during the survey was *H. chrysoscelis*; 107 individuals were found across three sites. Seven males were heard calling at sites 1 (1) and 8 (6) during the day in a wooded area near a body of water. An estimated 100 were heard calling and seen mating around the flooded areas of the beach at site 7.

10. *Hyla versicolor* (Gray Treefrog) Roughly 50 *H. versicolor* were found at site 7. All were congregated around flooded vernal pools along the beach calling, and some were in amplexus. An additional male was observed calling during the day at site 8 in a wooded area near a stream.

11. *Lithobates clamitans* (Green Frog) Twelve *L. clamitans* were found across 5 sites. They were found near a body of water at every site they were recorded: P3 (1), 1 (1), and 7 (6). Tadpoles of this species were also caught by net at sites 2 (2), 7 (1), and 8 (1).

12. *Lithobates palustris* (Pickerel Frog) Two *L. palustris* were found at site 7 at the water's edge of Old Pond.

13. *Lithobates sylvaticus* (Wood Frog) There was one young *L. sylvaticus* found at site 3. This individual was found in leaf litter near a vernal pool. This was the first time a Wood Frog has been documented in Spotsylvania County. A photo was submitted as a voucher (VHS Archives #210).



14. *Notophthalmus viridescens viridescens* (Red-Spotted Newt) Eleven *N. v. viridescens* were found across six sites. Six of the newts found were adults located in a stream at sites 6 (1), 7 (3), 8 (1), and 9 (1). The rest were the eft form found in leaf litter or under cover

objects in a woodland habitat at sites: 3 (2), 4 (2), and 8 (1).

15. Plethodon cinereus (Eastern Red-Backed Salamander) There were 19 *P. cinereus* found across five sites: P3 (3), 3 (6), 4 (7), 5 (1), and 9 (2) in woodland habitat under cover objects. One interesting specimen found at site 5 was on moss inside a discarded glass jar on the forest floor.

16. *Plethodon cylindraceus* (White-spotted Slimy Salamander) There were 5 *P. cylindraceus* found across four sites: P1 (2), 4 (1), 6 (1), and 8 (1) under logs in a woodland habitat. The two adults found at site P1 were a male and a female due to the presence and absence of a mental gland respectively.

17. Pseudacris crucifer (Spring Peeper) Four *P. crucifer* were found across three sites: 1 (2), 2 (1), and 6 (1). All sightings were auditory observations in the woods not necessarily near water.

18. *Pseudacris feriarum* (Upland Chorus Frog) Seven *P. feriarum* were found across three sites. At sites P1 (2) and 9 (4), they were observed under logs or in the leaf litter. At site 1 a single male was heard calling in a woodland habitat. This was the first time *P. feriarum* was verified in Spotsylvania County and a photo was entered into the database (VHS Archives #211) as a voucher.

19. *Pseudotriton ruber ruber* (Northern Red Salamander) There were six *P. r. ruber* found across three sites. At sites 4 (1) and 11 (1) the animals were adults found under a log away from water. At sites 4 (2) and 8 (2) they were found under cover objects next to or in the steam. One of the individuals found at site 8 was a larval specimen found under a rock. This was the first verified *P. r. ruber* in Spotsylvania County and a photo was submitted as a voucher (VHS Archives #214).

Reptiles

20. *Agkistrodon contortrix* (Eastern Copperhead) One *A. contortrix* was found at site 11. It was found coiled next to a log out of the sun.

21. *Carphophis amoenus amoenus* (Eastern Wormsnake) The most abundant reptile was *C. a. amoenus*. Twenty-nine individuals were found across 11 sites. Twenty were found under a rock or a log at sites: P2 (1), P3 (1), 2 (3), 3 (4), 4 (2), 5 (1), 6 (2), 9 (4), and 10 (2). Two were under man-made litter at site 5. Individuals were found in a log at sites 2 (3) and 8 (2). At site 1, one was found on top of a log. At site 3 another was found dead in a stream with an injury to its tail.

22. *Chelydra serpentina* (Eastern Snapping Turtle) Four *C. serpentina* were found at sites 7 (1) and 8 (3). A young snapper was seen near one of the crayfish traps during the 19 May evening survey at site 7. Three snapping turtles were removed from the crayfish traps at site 8 on Sunday 20 May.

23. *Chrysemys picta picta* (Eastern Painted Turtle) Three *C. p. picta* were found at sites 8 (2) and 10 (1). One painted turtle was removed from the crayfish traps on Sunday 20 May and it had several leeches present on its body and a stained plastron from the tannic water. Another was found at site 8 basking by the rocks at the outfall of Old Pond. At site 10 a painted turtle was seen in the river.

24. *Coluber constrictor constrictor* (Northern Black Racer) Three *C. c. constrictor* were found at sites P2 (1) and 10 (2). At site P2 the racer was observed basking in leaf litter. At site 10, two were observed at the edge of forest habitat and the open area of power lines. This was the first time *C. c. constrictor* was found in Spotsylvania County and a photo was entered in the VHS archives as a voucher (VHS Archive #507 from site P2).

25. *Diadophis punctatus edwardsii* (Northern Ring-necked Snake) Four *D. p. edwardsii* were observed at sites 4 (3) and 6 (1). At site 4, one was found in a stump, the other two under a log. One of the individuals under the log was observed eating termite larvae. The lone individual at site 6 was under a log.

26. *Nerodia sipedon sipedon* (Northern Watersnake) Ten *N. s. sipedon* were found at sites P3 (1), 7 (7), and 10 (2). The individual found at P3 was a deceased juvenile with no obvious trauma. Six of the seven *N. s. sipedon* at site 7 were juveniles or sub-adults observed in the water near frogs that were calling. The remaining individual at site 7 was a large adult seen on the shore at the beginning of the night survey on 19 May. The two individuals seen at site 10 were adults in the water.

27. *Pantherophis alleghaniensis* (Eastern Ratsnake) A single *P. alleghaniensis* was found at site 11 in the forest.

28. *Plestiodon fasciatus* (Common Five-lined Skink) Four *P. fasciatus* were found across four different sites: P1, 3, 4, and 11. At sites 3 and 4 individuals were noted under the bark of a dead tree. At site 11 the lone individual was noted as being on a fallen log.

29. *Plestiodon inexpectatus* (Southeastern Five-lined Skink) A single *P. inexpectatus* was documented at site P2 under a rock. The tip of the tail was missing on this individual. This was the first verified *P. inexpectatus* in Spotsylvania County. A photo was entered into the VHS archives (#212) as a voucher.

30. *Plestiodon laticeps* (Broad-headed Skink) Three *P. laticeps* were documented at sites P2 (1) and 10 (2). The scalation on this large adult can be verified as a Broad-headed Skink and it's the first time it has been documented in Spotsylvania County. A photo was entered in the VHS archives (VHS Archive #213) as a voucher. It should be noted that 11 unidentified *Plestiodon spp.* were found across five sites: 2 (1), 6 (1), 8 (1), 9 (2), and 10 (6). Since the skinks could not be captured, scalation could not be counted and in turn the specific species could not be verified.

31. *Sceloporus undulatus* (Eastern Fence Lizard) There were five *S. undulatus* found, at sites P1 (1), 9 (3), and 10 (1). Across all of the sites *S. undulatus* were seen at edge habitats. At sites P1 and 9 they were noted to be basking.

32. Scincella lateralis (Little Brown Skink) A single *S. lateralis* was found at site P2 in a lowland habitat near the lake under bark.

33. *Storeria occipitomaculata* (Red-bellied Snake) Three *S. occipitomaculata* were found at sites P2, 2, and 4. At sites P2 and 2 they were found under logs. At site 4 *S. occipitomaculata* was observed on the ground near a stream.

34. *Terrapene carolina carolina* (Woodland Box Turtle) Twenty-seven *T. c. carolina* were found across 9 sites: P2 (1), 2 (2), 3 (3), 4 (2), 5 (2), 8 (4), 9 (2), 10 (8), and 11 (3). They were found in a variety of habitats. Twelve *T. c. carolina* were found in woodland habitats at sites P2 (1), 3 (3), 5 (1), 8 (3), 9 (1), and 11 (3). Notably a pair was seen mating at site 8 and a deceased individual was also found at site 8. Seven individuals were found in a field or edge habitat at sites 4 (1), 5 (1), and 10 (5). The individual found at site 5 was deceased. Four *T. c. carolina* were found in aquatic habitats such as a puddle, pond, or stream at sites 2 (2), 4 (1), and 8 (1). Four individuals were also observed on the road at sites 9 (1) and 10 (3). The Woodland Box Turtle is a VDGIF Tier IIIa species.

35. *Thamnophis sauritus sauritus* (Common Ribbonsnake) A single *T. s. saurita* was found at site 10. This is the first time *T. s. saurita* was documented in Spotsylvania County. The Common Ribbonsnake is a VDGIF Tier IVa species. A photo has been entered into the VHS archives (#215) as a voucher.

36. Trachemys scripta elegans (Red-Eared Slider) Three non-native *T. s. elegans* were found between sites 7 (1) and 8 (2). The one found at site 7 was a deceased juvenile on the edge of a vernal pool on the beach. This is the first time this invasive species has been documented in Spotsylvania County and a photograph was submitted as a voucher (VHS Archive #216).

37. Virginia valeriae valeriae (Eastern Smooth Earthsnake) A single *V. v. valeriae* was documented at site P3 under a 2 x 4 board in woodland habitat.

Discussion

Lake Anna State Park was selected as a survey location due to the different types of habitats available such as aquatic (lakes, ponds, vernal pools, and streams), woodland habitat, edge habitat, and open fields. Spotsylvania County, where Lake Anna State Park is located, had not previously been surveyed by the Virginia Herpetological Society. Prior to this survey Spotsylvania County had 37 documented species of herpetofauna. After the completion of the Spring Survey, Spotsylvania County now has 47 species as a result of the 10 new records documented. There are still many outstanding species that are likely to be found in the county - 17 if all are eventually documented. The remaining 17 species of herpetofauna that are expected to be found in Spotsylvania County will be discussed in detail below.

There are three anurans expected to be found at Lake Anna State Park, but were not documented. *Gastrophryne carolinensis* (Eastern Narrow-mouthed Toad) is likely in Spotsylvania County. It has been found to the southeast in Caroline County and to the south in Hanover County. It is also expected in Louisa County to the southwest (VHS database). There was ample habitat for this species, such as shelter objects like logs and rocks and moist soil to burrow into and bodies of water to breed in (Beane et al, 2010). *Lithobates catesbeianus* (American Bullfrog) and *Lithobates sphenocephalus* (Coastal Plains Leopard Frog) are also likely in Spotsylvania County. They have been or are likely found in all the surrounding counties (VHS database). Their preferred habitat is wetland environments (Mitchell

and Gibbons, 2010) which are plentiful within several survey sites at Lake Anna. Venturing into other wetland areas in the park or conducting nighttime frog call surveys across several sites could help locate these additional species.

There are three species of salamanders that were thought to be found on this survey: *Siren lacertina* (Greater Siren), *Siren intermedia intermedia* (Eastern Lesser Siren), and *Pseudotriton montanus montanus* (Eastern Mud Salamander). *Siren lacertina* is thought to be likely found in Spotsylvania and is found just over the border in nearby Caroline County and thought to be found in Stafford County to the northeast (VHS database). Although *S. i. intermedia* is found in neighboring Caroline and Hanover Counties to the southeast, it is thought to be possible but not likely in Spotsylvania (VHS database). There is plenty of slow-moving water habitat that is preferred by both species (Mitchell and Gibbons, 2010) within Lake Anna. More turtle traps should be set in smaller wetland areas to have better success finding them. *Pseudotriton m. montanus* is found Caroline and Hanover to the southeast and Stafford to the northeast. There were plenty of slow-moving streams with decaying vegetation, which is their preferred habitat (Petranka, 1998) across sites 2, 3, 8, and 9.

Seven species of snakes were expected to be found in Spotsylvania County: *Cemophora coccinea copei* (Northern Scarletsnake), *Farancia erytrogramma erytrogramma* (Common Rainbowsnake), *Heterodon platirhinos* (Eastern Hog-Nosed Snake), *Lampropeltis triangulum* (Eastern Milksnake), *Opheodrys aestivus* (Rough Greensnake), *Pantherophis guttatus* (Red Cornsnake), and *Regina septemvittata* (Queensnake). *Cemophora coccinea copei* is found in Hanover County to the south (VHS database) and is likely in Stafford County to the north (VaFWIS database). *Farancia e. erytrogramma* is found in Caroline County to the southeast (VHS database). *Heterodon platirhinos* is found in almost all the surrounding counties including: Stafford, Caroline, Hanover, Louisa, and Culpepper Counties (VHS database). *Lampropeltis triangulum* is considered likely in Spotsylvania (VaFWIS database) and many of the counties surrounding Spotsylvania, but has only been documented in Fauquier County to the north (VHS database). *Pantherophis guttatus* has been documented in Caroline, Hanover, Louisa, Orange Counties (VHS database) and is likely in Culpeper and Stafford Counties to the north (VaFWIS database). *Opheodrys aestivus* is found in all of the counties surrounding Spotsylvania: Stafford, Caroline, Hanover, Louisa, Orange, and Culpepper Counties (VHS database) and is likely in Spotsylvania (VaFWIS database). *Regina septemvittata is* found in Caroline and Hanover Counties to the southeast and Culpeper and Stafford to the north (VHS database). There are ample aquatic habitats such as streams, vernal pools, and marshy areas that would attract both *F. e. erytrogramma* and *R. septemvittata* (Linzey and Clifford, 1981) at sites 2, 3, 8, and 9. For the remaining five snakes likely found in Spotsylvania County (*C. c. copei, H. platirhinos, L. triangulum, O. aestivus, P. guttatus,* and *R. septemvittata*) there is potential habitat at almost all of the sites on the survey. The five aforementioned snakes prefer cover objects such as rocks and logs and forested habitat (Linzey and Clifford, 1981). There was also edge habitat where snakes like *H. platirhinos, L. triangulum, O. aestivus* and *P. guttatus* could be able to bask. Another way to go about sampling for these species is putting out cover-boards beforehand to try to document these sometimes hard to find species. This is something the VHS should discuss with landowners and park managers in advance of future surveys to find more snake species.

There is one species of lizard that was expected to be found in Spotsylvania County that was not; *Aspidoscelis sexlineata sexlineata* (Eastern Six-lined Racerunner). *Aspidoscelis s. sexlineata* is found in three counties to the south of Spotsylvania: Caroline, Hanover, and Louisa (VHS database). Although they are not as commonly found in the Piedmont when compared to the Coastal Plain, their preferred habitat is sandy soil with lots of grass that enables them to hide when encountered by predators (Beane et al., 2010). These lizards could be expected in the loamy, grassy habitats at sites 5 and 6 and potentially in the open, edge habitat of site 10.

Three turtles that were not encountered on this survey, but are thought to be in Spotsylvania County are: *Clemmys guttata* (Spotted Turtle), *Kinosternon subrubrum subrubrum* (Southeastern Mud Turtle), and *Pseudemys concinna concinna* (Eastern River Cooter). *Clemmys guttata* is found in Stafford County to the northeast and Hanover and Louisa Counties to the south. *Kinosternon s. subrubrum* is found in four counties surrounding Spotsylvania: Stafford, Caroline, Hanover, and Louisa (VHS database). Both *C. guttata* and *K. s. subrubrum* prefer slower-moving bodies of water such as creeks, marshes, and ponds (Beane et al., 2010) which was present at sites 3, 7, and 8. *Pseudemys c. concinna* is found in Stafford County to the northeast and is likely in Caroline, Hanover, and Louisa Counties. Typical habitat for this species includes large ponds and lakes with areas for basking (Beane et al., 2010) which are present at sites 1, 6, 7, and 8.

Additional surveys of Lake Anna State Park and working with park staff to take additional steps may uncover more species that have yet to be documented. Different actions could be taken to help uncover the remaining 17 species of herpetofauna in Spotsylvania County such as: placing coverboards in ideal locations could help unveil some additional snakes in the park; setting more aquatic hoop traps in different bodies of water could help uncover turtles and salamanders that weren't documented; and conducting nighttime frog call surveys during different times of the year could help uncover frogs that haven't been documented yet.

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A Herpetological Survey of the Edith J. Carrier Arboretum at James Madison University (Harrisonburg, Virginia)

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Abstract: The Edith J. Carrier Arboretum is a 50-hectare site located in Harrisonburg, VA. A herpetofaunal survey was conducted on the site from October 2017–August 2018 using visual encounter, bioacoustics surveys, cover boards, and aquatic turtle traps. A total 2 amphibian species and 8 reptile species and subspecies were documented, including two species of special concern (*Chelydra serpentina* and *Terrapene carolina carolina*) and two introduced species (*Trachemys scripta scripta* and *Trachemys scripta elegans*). This represents an increase from the five species previously documented in the City of Harrisonburg, of which only one species (*Plethodon cinereus*) was found during this study. These surveys help to document the amphibian and reptile diversity of the City of Harrisonburg and inform educational programs at the Edith J. Carrier Arboretum.

Key Words: Herpetological survey, Edith J. Carrier Arboretum, City of Harrisonburg, *Trachemys scripta*, *Chelydra serpentina*, *Terrapene carolina*

INTRODUCTION

The Edith J. Carrier (EJC) Arboretum was established in 1989 on the campus of James Madison University (JMU) in Harrisonburg, Virginia. The EJC Arboretum is state-owned and maintained by JMU with financial support for staff, programs, and facilities provided by public and private donors. The 50-hectare site ranges in elevation from 400–500 m a.s.l. (Figure 1). The site is

dominated by 100-year old oak (*Quercus sp.*) and hickory (*Carya sp.*) forests with a riparian area dominated by Eastern Redbuds (*Cercis canadensis)* and American Sycamore (*Platanus occidentallis)*. An ephemeral stream feeds a man-made pond (approximately 1400 square meters) that is surrounded by Bald Cypress (*Taxodium distichum*) and Sycamore. The arboretum contains both naturally occurring and intentionally planted native species of trees, shrubs, woody vines, perennial herbaceous vegetation, and wildflowers (H. Griscom, pers. comm). The EJC Arboretum serves as a public venue and outdoor classroom for formal and informal educational programs that serve Harrisonburg and the surrounding area. Self-guided and docent-guided tours are available in addition to summer camps and other outreach activities (James Madison University, 2018). Despite this strong infrastructure little information about the herpetofauna of the site has been available either online or in print.

Five species of amphibians and reptiles have previously been documented from the independent City of Harrisonburg (Rockingham Co, VA) (*Ambystoma maculatum, Eurycea bislineata, Notophthalmus viridescens viridescens, Plethodon cinereus,* and *P. punctatus*; VHS database, 2019). Most of these represent specimens collected in 1937 or 1944 (United States Geological Survey, 2019). Harrisonburg has undergone significant development since then, and it is worth investigating whether these species are still present in the city. Similarly, the taxonomy and systematics of many species has been revised since these records were first made and it is worth noting that *P. punctatus* is not known to occur in this area and the historical record may be specimens confused with *P. cylindraceus* (Graham, 2007), Because of the low number of previous records from Harrisonburg City and because species distributions do not follow political boundaries, we considered the species documented from surrounding Rockingham County, where a total of 56 species and subspecies have been documented, 19 of which are salamanders (VHS database, 2019). Despite the diversity of flora and habitat types present within the EJC Arboretum it is not anticipated that all species occurring within Rockingham County will be present at this site. The EJC arboretum represents a forest fragment bordered by roads, apartments, and urban development that are likely to serve as barriers to the immigration and emigration of amphibians and reptiles. Prior to this study, the arboretum has been the focus of occasional surveys for common species of reptiles and amphibians (e.g., *Thamnophis sirtalis* and *Plethodon cinereus*) and course-related projects conducted by JMU students. To our knowledge, none of these studies have resulted in published accounts of the herpetofauna of the EJC arboretum. In response to a recognized need for a faunal inventory at this site that could facilitate formal and informal education as well as current and future research, a herpetofaunal survey was conducted from October 2017–August 2018.

Study Site

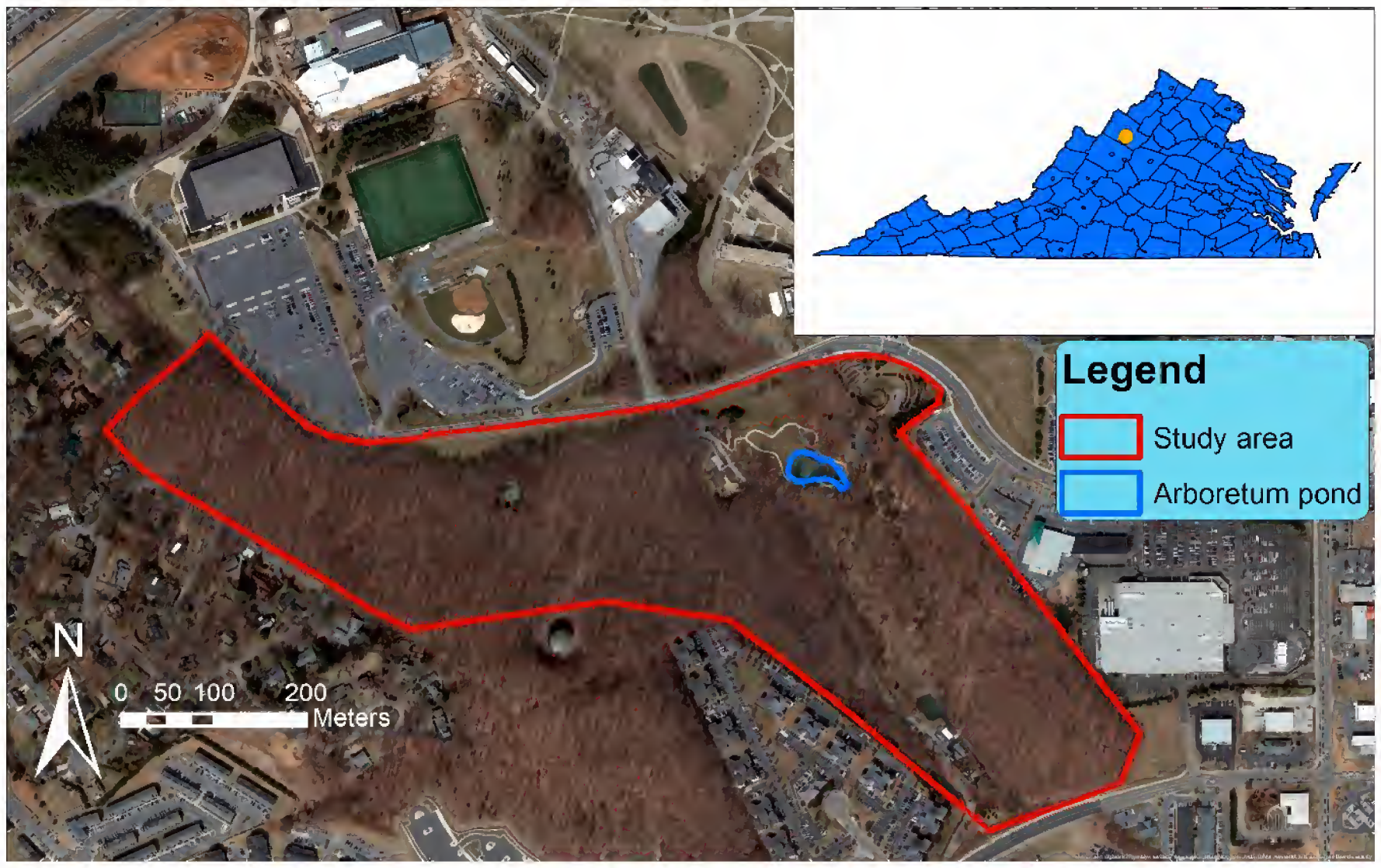


Figure 1. Area surrounding EJC arboretum. The study site outlined in red, and the pond in the Arboretum is outlined in blue. Orange circle in inset indicates location of the study site.

MATERIALS AND METHODS

This survey was initiated as a course-embedded research project for JMU's Herpetology course (BIO 427) during the spring semester 2018. The project was used to introduce field survey methods including visual encounter surveys, bioacoustic surveys for amphibians, and the use of baited hoop traps for turtles, and artificial coverboards for detecting amphibians and reptiles during repeated survey efforts. Additional survey efforts were made by the authors subsequent to the completion of the course. All individuals encoutered were photographed, measured with a straight ruler (snout–vent length), weighed using a digital scale, and released. Field notes documented conditions at the time of capture including date, time, temperature, humidity, weather conditions, and the specific method of observation. A Kestrel 5500 hand held weather station was used to document temperature, wind speed, and relative humidity. Bioaccoustic observations of calling frogs were verified by comparison to published calls (*e.g.*, http://www.virginiaherpetologicalsociety.com). Artificial cover objects included 30 pieces of 61x30x1.5 cm rubber stall matting and four pieces of 91x91cm corrugated metal sheets. The use of both rubber matting (Marsh and Goicochea, 2003) and metal sheeting (Engelstoft and Ovaska, 2000) has been shown to be an effective survey

method for amphibians (especially salamanders) and reptiles. Cover boards were placed in areas throughout the arboretum representing different habitat types (Figure 2). All coverboards were tethered to a tent stake to prevent re-location or removal. We used a 91cm diameter hoop-trap to collect turtles in the arboretum pond. Traps were baited with dry dog food, suspended in perforated plastic containers and placed so the opening was fully submerged while keeping the opposite end partially exposed above the water line (Figure 3). A single trap was deployed to multiple locations within the pond from April–August 2018. Traps were checked daily and removed when heavy rains were forecasted to ensure no turtles were drowned in the traps. Turtles caught in the traps were given individual marks on their marginal scutes (following Nagle *et al*. 2017) to prevent double counting and to allow for future studies of population dynamics. The total effort for each method is provided in Table 1.

Additional observational records of amphibians and reptiles at the EJC Arboretum were obtained from citizen-scientist data documented using iNaturalist (https://www.inaturalist.org/). iNaturalist observations include a photograph of the specimen, date, time, temperature, and other details relevenat to the collection of observation and are posted online for public use and knowledge. Records from iNaturalist were only included in the results if latitudinal/longitudinal data placed the observation within the EJC Arboretum, and secondly if the species observed could be verified from the image provided in iNaturalist.

Table 1. Summary of survey efforts by number of participants and time spent per survey method used in the EJC arboretum. Visual Encounter Surveys =VES.

	VES	Bioacoustic	Coverboards	Turtle Traps	Total
Number of Surveyors	2	2	3	1	
Hours Surveyed (h)	15	2	10		
Number of trap days (td)				29	
Total	30h	4h	30h	29td	64h/29td

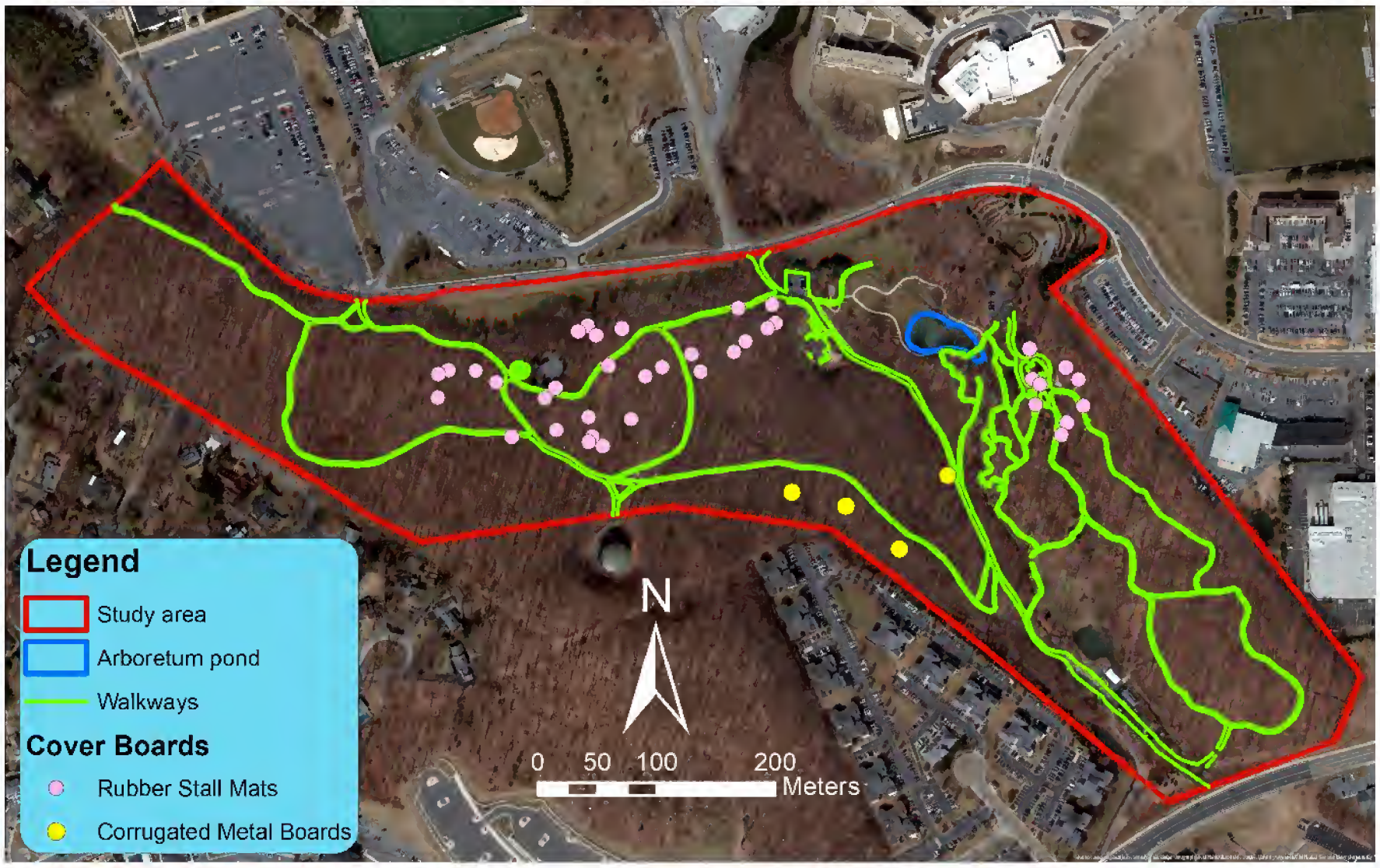


Figure 2. Locations of coverboards in the Edith J. Carrier Arboretum. Pink dots represent rubber stall mats and yellow dots represent corrugated metal cover boards.

Figure 3. Turtle trap in water. Traps were partially submerged and baited with dry dog food placed inside a perforated plastic container suspended inside the trap.

RESULTS

We documented 68 individuals representing nine species in the EJC Arboretum during this survey. Two species of amphibians and seven species of reptiles

were observed. Among these, more observations were made of *Plethodon cinereus* than any other species. Only five species (*Lithobates catesbeianus, Pantherophis alleghaniensis, P. cinereus, Trachemys scripta elegans,* and *T. s. scripta*) were documented using iNaturalist (Table 2).

Table 2. Total number of individual amphibian and reptiles recorded in the EJC Arboretum.

Amphibians		**Direct**	**iNaturalist**	**Total**
Plethodon cinereus	Eastern Red-backed Salamander	32	7	39
Lithobates catesbeianus	American Bull Frog	4	2	6
Reptiles				
Chelydra serpentina	Common Snapping Turtle	2		2
Chrysemys picta	Eastern Painted Turtle	2		2
Diadophis punctatus edwardsii	Northern Ring-Necked Snake	1		1
Pantherophis alleghenensis	Eastern Ratsnake	3	1	4
Terrapene carolina carolina	Woodland Box Turtle	1		
Thamnophis siritalis siritalis	Eastern Garter Snake	3		3
Trachemys scripta elegans	Red-Eared Slider	7	3	10
Trachemys scripta scripta	Yellow Bellied Slider	1	1	2
	Total:	55	14	69

Annotated Checklist

Amphibians

1. Plethodon cinereus (Eastern Red-backed Salamander). A total of 39 *P. cinereus* were found. Most (32) were observed under artificial and natural cover objects throughout the arboretum. Two color morphs of the Eastern Red-backed Salamander (red-backed morph and lead-backed) occur at the EJC Arboretum and are pictured below.

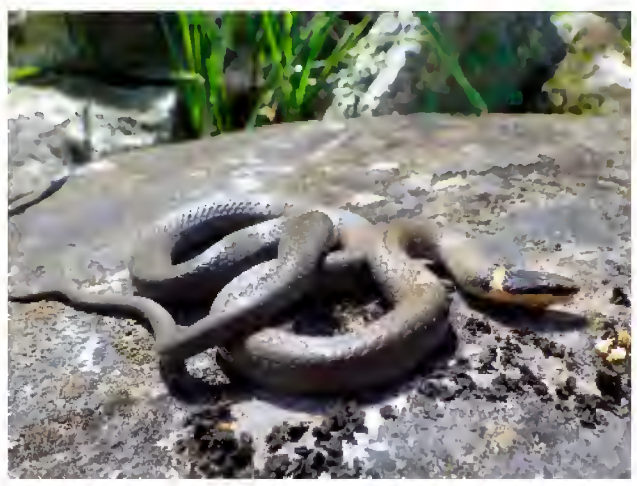
2. *Lithobates catesbeianus* (American Bull Frog). Four individuals were observed, two of these were heard calling from the bank of the EJC Arboretum pond. Two observations of this species were recorded on iNaturalist.

Reptiles

3. *Chelydra serpentina* (Common Snapping Turtle). Two *C. serpentina* individuals were caught in the turtle traps.

4. *Chrysemys picta* (Eastern Painted Turtle). Two *C. picta* were found in turtle traps. One individual was caught in the turtle traps at the same time as two *C. serpentina.*

5. *Diadophis punctatus edwarsdii* (Northern Ring-necked Snake). One *D. p. edwarsii* was found on leaf litter under a piece of bark.



6. *Pantherophis alleghenehsis* (Eastern Ratsnake). On iNaturalist a single record of P. *alleghenensis* found dead on the road that bordered the EJC Arboretum. Three individuals were found; one on a mulched trail, one under a log, and one resting on a log.

7. *Terrapene Carolina carolina* (Woodland Box Turtle) No *T. c. carolina* were found during initial surveys. However, an individual was encountered on 26 September 2019. Arboretum staff noted seeing multiple individuals in 2018 and 2019 (R. Wood, pers. comm.).

8. *Thamnophis siritalis siritalis* (Eastern Garter Snake) One *T. s. siritalis* individual was found under the metal corrugated sheets that were placed in the EJC Arboretum. Two others were found resting on top of leaf litter.

9. *Trachemys scripta elegans* (Red-eared Slider). Seven *T. s. elegans* were collected using turtle traps in the EJC Arboretum pond. Each turtle was individually marked and released. Three indivduals were documented on iNaturalist.

10. *Trachemys scripta scripta* (Yellow Bellied Slider). One *T. s. scripta* was found in the pond and one was documented on iNaturalist.

DISCUSSION

The goal of this survey was to document the presence of amphibians and reptiles in the EJC Arboretum. Because of the nature of the study, we make no attempt to assess population sizes. The data presented here should be considered a baseline from which other studies can address quantitative aspects of the herpetofaunal community. We employed both direct (e.g., visual encounter surveys) and indirect (e.g., iNaturalist) methods for documenting species presence at this site. It is not unreasonable that the individuals recorded in our surveys were the same as those found by citizen-scientists who documented them using iNaturalist, and we have not made any efforts to reconcile these observations because they achieve the goal of providing evidence of a species occurrence at this site. Additionally, we recognize that additional survey work may reveal more species than encountered in our study. We recommend the continued use of citizen-scientist data via iNaturalist as an effective way of gathering data and engaging the broader community in the study of the biodiversity of the EJC Arboretum.

A total of 55 individuals representing two species of amphibians and seven species of reptiles were recorded via direct observation during the EJC Arboretum survey. An additional 13 records, representing five

species were made concurrently by community members via iNaturalist. These represent a significant increase from the five species previously reported from Harrisonburg City. Of the previously reported species, we found only *P. cinereus*. In comparison to the herpetofauna of Rockingham county, the EJC Arboretum seems to have relatively low diversity (VHS database, 2019). Many of the 19 salamander species (and subspecies) known to occur in Rockingham County and Harrisonburg City were not found in the survey (Beane *et. al.,* 2010; VHS database, 2019). It is worth noting that two species found within the EJC Arboretum (*Trachemys scripta scripta* and *Chelydra serpentina*) are considered species in need of moderate conservation in Virginia, and one species (*Terrapene carolina*) is considered a species of high conservation need (Virginia Wildlife Action Plan, 2015). *Trachemys scripta scripta* is native to southeast Virginia in the Coastal Plain and Tidewater Region but not the Valley and Ridge Region of Virginia (Mitchell and Reay, 1999; Tobey, 1985). It therefore seems likely that this species has been introduced to this site. We found only one specimen of *T. s. scripta* during our survey and recommend future studies to determine the actual population status of this species in the EJC Arboretum. Similarly, *T. s. elegans* is a non-native and extremely successful invasive species that has been globally introduced through the pet trade. Its presence at the EJC Arboretum is not surprising. Our data suggest that non-native turtles are more abundant at the EJC Arboretum than native species. Given that the focus of the EJC Arboretum is native flora and fauna, it would seem worthwhile to consider the establishment of a management plan for invasive species of amphibians and reptiles at this site. Moreover, we strongly discourage the practice of the release of captive animals, especially into non-native locations because of the devastating consequences to entire ecosystems, including the extirpation of local and native species, introduction of disease, and disruption of established communities. (Doherty, *et al.* 2016).

With respect to the absence of other species that are known to occur within Rockingham County, it would seem that anthropogenic effects (*i.e.,* urbanization, herbicides/ pesticides in runoff water, and etc.) and habitat availability are the two greatest limiting factors. The EJC Arboretum is situated on the JMU campus within the city of Harrisonburg. It is bordered on three sides by roads with speed limits of 25–35mph; the fourth border is an apartment complex. This forest fragment has no connection to other natural forest habitats, thereby limiting opportunities for immigration and emigration of native species. The isolation of this site could also limit the re-establishment of a population if any of the current species were ever extirpated.

Habitat alteration at the site may also contribute to the low diversity documented during our study. The pond is man-made and has been drained and renovated at least two times since 2015 (McLeod, pers. obs) for the purpose of repair to the pond liner and flood water mitigation. Similarly, the intermittent stream has been reconstructed recently and has had significant changes made to it (channelization and bank repair) in an effort to improve flood control measures and enhance the aesthetics of the site. Because of the ephemeral, and man-made nature of the stream it is unlikely that aquatic and semi-aquatic salamanders (e.g., *Desmognathus, Eurycea,* and *Gyrinophilus*), though present in the county are not expected to occur at this site. Additionally, the pond contains a mixture of ornamental (e.g., *Cyprinus rubrofuscus*) and natural fish species (e.g., *Lepomis cyanellus*, *Ictalurus punctatus*, and

C. carpio) which has been shown to be a limiting factor for amphibian species that breed exclusively in fish free ephemeral ponds (Hopey and Petranka, 1994). Herpetofaunal diversity at a site can decrease when fish are introduced and subsequently feed on eggs, larvae, and post-metamorphic amphibians (Holbrook and Dorn, 2015). *Lithobates catesbeiana, L. clamitans, Acris crepitans,* and *Anaxyrus americanus* are all known to occur at ponds containing fish, though some may be less successful at these sites than at fish-free ponds (Werner and McPeek, 1994; Smith and Dibble, 2012). These species are also known to be successful human commensals, and all are documented elsewhere in Rockingham County (Mitchell and Reay, 1999). It is therefore somewhat surprising that only *L. catesbeianus* was at this site during our study.

Our study of the herpetofauna of the EJC Arboretum was conducted over multiple months and used a variety of survey methods. Nevertheless, it is likely that other species occur at this site but were undetected during our study. For example, due to the elusive nature and small size of *Carphophis amoenus amoenus* (Eastern wormsnake), detection of the species could have easily been overlooked (Ernst, Orr, Creque, 2003). Species in the *Plestiodon* genus (toothy skinks) are extremely quick and have the ability to climb trees making them difficult detect. Therefore, camera traps may be a more effective method for detecting any *Plestiodon* species (Adams, *et al.* 2017). It seems likely that future studies at this site and the use of citizen-scientist efforts in documenting diversity will result in additional discoveries and a broader understanding of the herpetofaunal community.

Further studies throughout Harrisonburg are warranted to better document the herpetofauna of the city and determine if the species originally documented in the area are still present. It is our hope that the results of this study will inform and facilitate both formal and informal scientific activities at the EJC Arboretum and around Harrisonburg.

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Eastern Mud Salamander (*Pseudotriton montanus montanus*) VA: Henry County, Patrick Henry Community College, 645 Patriot Avenue (36°44'32.82"N, 79°52'35.20"W). 26 June 2019. Jason L. Worley, Marco Diaz, and Jason D. Gibson

County record: The Eastern Mud Salamander is found in roughly one-third of the counties in Virginia, with a majority localized in the coastal plain region of the state. The coastal plains of Virginia are characterized by low-lying floodplains, consisting of a variety of waterways, including swamps, rivers, estuaries, and streams that are subject to periodic flooding and overbank deposition. This type of habitat is ideal for the Eastern Mud Salamander, which is usually found under logs and rocks within streams or in wet, muddy, low-lying areas near a stream or along margins of swamps, seeps, or wet, flooded areas (Petranka, J.W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press. Washington D.C. 587pp.). In the south central portion of its distribution, there are records of the Eastern Mud Salamander as far west as Franklin and Floyd Counties in the Piedmont and the Blue Ridge physiographic provinces respectively. In the west central range, Henry Wilbur reported finding numerous Eastern Mud Salamanders at Maple Flats in Augusta County in 2003 (VaFWIS database). Records in all these counties extend beyond the "Fairfax-Martinsville line," first proposed by Hoffman (1993. Field Note: *Pseudotriton montanus* (Eastern Mud Salamander). *Catesbeiana* 13(2): 46-47) as an approximation of the western limits of the species. These discoveries further west may suggest a wider range than first thought. Maple flats has a unique floral and faunal community. The Eastern Mud Salamander population there may represent a relictual population much like the Eastern Tiger Salamander which also inhabits that area (Church, S. A., J.M. Kraus, J.C. Mitchell, D.R. Church, and D.R. Taylor. (2003). Evidence for multiple Pleistocene refugia in the postglacial expansion of the eastern tiger salamander, Ambystoma tigrinum tigrinum. Evolution, 57(2), 372-383.).

This note reports what we believe to be the first documented sighting of the Eastern Mud Salamander in Henry County, Virginia. This conclusion is based on reviewing the records of Vertnet.org, VaFWIS database, Mitchell and Reay (1999. An Atlas of Amphibians and Reptiles in Virginia. Special Publication No. 1. Virginia Department of Game and Inland Fisheries, Richmond, VA. 122 pp.), Tobey (1985. Virginia's Amphibians and Reptiles: A distributional survey. Virginia Herpetological Society 114 pp.), and the amphibian collections at the Virginia Museum of Natural History.

On 26 June 2019 an Eastern Mud Salamander (Total length (TL) - 9.7 cm, Tail length - 4.2 cm, Snout-vent length (SVL) - 5.5 cm) was found on the campus of Patrick Henry Community College. Two additional sightings of different mud salamanders were made on 17 July and 7 August. All of our sightings of the Eastern Mud Salamander were made in the same area. Each animal was found under small sticks on muddy land between a small flowing spring running parallel with a small perennial stream. Both the spring and the small stream flow into a large reservoir lake near the capture site. A small silt based muddy floodplain microhabitat has formed between the spring, stream, and lake intersection. Within this site there is limited leaf litter, many small sticks, and an abundance of small herbaceous plants. The site is covered by a full canopy of *Fagus grandifolia* (American Beech) with an understory of *Carpinus caroliniana* (Ironwood), *Acer rubrum* (Red Maple), and

Oxydendrum arboreum (Sourwood). The habitat in which we observed the Eastern Mud Salamander coincides with small floodplains near streams where the species was recorded in other Piedmont counties, including Appomatox, Charlotte, Nottoway, and Pittsylvania counties (Hoffman op. cit.).

This work was conducted under the VDGIF collecting permit #064948. A digital photo voucher has been deposited in the VHS digital archives (#548)

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***Carphophis amoenus amoenus* (Eastern Wormsnake).** VA: Dickenson County, Breaks Interstate Park (37.29696, -82.29439). 14 May 2019 Kaloyan Ivanov.

County record: The Eastern Wormsnake is a widespread and abundant member of Virginia's herpetofauna. It has been documented from nearly every county and independent city in the state (Mitchell, J.C. and K.K. Reay. 1999. Atlas of Amphibians and Reptiles in Virginia, Special Publication No.1, Virginia Department of Game and Inland Fisheries, Richmond, VA, 122 pp.). Because of lack of survey efforts in some areas and the fossorial nature of this snake, a few counties are still lacking data for this species.

On May 14 2019, while conducting insect surveys at Breaks Interstate Park I observed an adult wormsnake under a large embedded rock in a mixed-mesic woodland with an open understory and plentiful leaf-litter. The observation was made approximately 30 meters NW from the edge of Beaver Pond, a small man-made pond in the north-central part of the park. Recent surveys of Breaks Interstate Park reported by Gibson, Sattler, and Roble (2016, Records of amphibians and reptiles from Breaks Interstate Park, Dickenson County, Virginia. Catesbeiana 36(1): 3-20.) were unsuccessful in finding this species despite surveying between May and July and spending more than 232 hours using 46 volunteers to survey the park. This observation represents a county record and shows the value of continuous survey work to document all taxa in a given area, even seemingly common ones. A photo voucher has been deposited in the VHS digital archives (#527).

I would like to thank Steve Roble and the Virginia DCR-Natural Heritage crew for making this trip possible.

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Crotalus horridus (Timber Rattlesnake) VA: Alleghany Co., County Landfill (37° 46 43.13"N, 80° 4 7.01" W). 12 June 2019. Mike Hayslett.

Color Variant: An adult timber rattlesnake of leucistic color phase was encountered at 12:30 pm on VA 600 (Rumsey Road), on the East side of the intersection with VA 658 (Jingling Rocks Road) at approximately 533 meters elevation. The rattlesnake had just been run over – the animal was alive momentarily, in spite of severe trauma wounds from its vehicular encounter – it expired as I first inspected it. The recovered DOR specimen was a male with a total length of 86.4 cm and a weight of 305 grams. The snake's rattle had been broken off at the base and was recovered nearby, with 8 segments accounted for.

The site of this encounter is an area that is generally remote, at the north end of Peters Mountain and surrounded by national forest; but the road receives fairly heavy truck traffic during the day, as it provides the approach to Alleghany County landfill. The weather for the region was characterized on this date by temperature extremes of approximately 11° C (low) and 26° C (high) with scattered, late-day thunderstorms occurring on 11 June and 12 June.

This partial albino (leucistic) individual was a beautiful anomaly, marked by an abundance of white and red scale coloration, especially around the anterior end and head. Five (5) photos were submitted to the VHS archives (# 545). Due to the damaged state of the carcass, only the skin was retained.

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Plestiodon fasciatus (**Common Five-lined Skink**) VA: Rockingham Co., VA approximately 0.3 miles east of the intersection of State Routes 602 and 646 (38°, 24', 34" N, -78°, 40' 08" W). 25 July, 2019. Patrina Casidy.

County Record: On 25 July, 2019 at approximately 16:00h, Patrina Casidy observed an adult common five-lined skink at her residence. The location is a wooded property in eastern Rockingham County approximately 2.5 miles west of the town of Elkton at an elevation of 1,060 feet. The skink had entered an open cooler and was unable to escape which allowed Mrs. Casidy to photograph and capture the skink. Photographs were sent to me (William Flint) and I identified it as likely a common five-lined skink, knowing though that close inspection of specific scale patterns would be required for positive identification. James Madison University biology graduate student Jack Doss drove to the location and took photographs of the midventral subcaudal and preorbital supralabial scales which were consistent with the common five-lined skink. The skink was then released back onto the property near its point of capture. I sent the photographs to Paul Sattler at Liberty University and VDGIF Herptologist J.D. Kleopfer, both of whom verified this identification. Jack Doss also measured the skink at 55mm SVL and 136mm TL. This observation of the common five-lined skink is a new county record and this species not been previously documented for Rockbridge County by Mitchell and Reay (1999. Atlas of Amphibians and Reptiles in Virginia. Special Publication Number 1, Virginia Department of Game and Inland Fisheries. Richmond, VA 122pp.) or the Virginia Herpetological Society (https://www.virginiaherpetological society.com/reptiles/lizards/common-five-lined-skink/five-lined_skink.php).

While this is the first verified record of this species from Rockingham County, I have personally observed skinks that were likely *P. fasciatus* in the Hone Quarry area of western Rockingham County, and have been sent photographs of skinks from eastern and western Rockingham that also likely belong to this species. However, in each instance the skinks were unable to be captured and/or photographs were insufficient to verify their identity. Mrs. Casidy reported to us that she regularly observes similar skinks on her property. Digital photographs of the individual detailed in this report were submitted to the VHS archives (#544).

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President's Corner

Hello fellow herp enthusiasts!

The fall meeting took place at the Virginia Department of Game and Inland Fisheries headquarters in Henrico. Twelve presentations on a variety of herpetological topics took place, as well as one scientific poster display. Larry Mendoza was also recognized as VHS member of the year for his tireless efforts in educational and outreach events, and the late Joe Mitchell was remembered for his massive contributions and influence to herpetology in Virginia and beyond. At least 70 people were present for the event, and a large amount of money was raised from the live and silent auctions and sale of various merchandise. Thank you to all of the presentation participants, DGIF for hosting the event, and to everyone that came out to enjoy this annual tradition.

After our fall meeting, the annual fall business meeting was held at the same location. Several topics were discussed and officer elections took place, and the positions of president and vice president saw a changing of the guard. For those of you I have not yet had the pleasure of meeting, I recently served as vice president under former president, Matt Neff. Before serving as vice president, I regularly attended surveys and meetings as a member of VHS since moving to Virginia in 2013. Prior to becoming a resident of the Commonwealth, I attended graduate school at Missouri State University, researching Alligator Snapping Turtle conservation and freshwater turtle ecology in Oklahoma. I also earned a B.S. in Environmental Science and Policy, with an emphasis in wildlife ecology and management from the University of Maryland, and an A.A. at Howard Community College in Maryland. My full-time job is with Henrico County Animal Protection, where I care for animals at the county shelter and assist officers, especially with the wild reptiles and amphibians they encounter. I am also an adjunct instructor of biology at Reynolds Community College. It is an honor to have the opportunity to serve the VHS and its enthusiastic members.

I would also like to take this opportunity to introduce our newly-elected vice president, Erin Chapman. Erin graduated with two B.S. degrees in Biology and Environmental Science and Policy from the College of William and Mary, and a M.S. degree in Ecology and Evolutionary Biology from Tulane University. Currently, she works as a middle school science teacher at Broadwater Academy. Her interests include sustainability, conservation biology, and ecology with a focus on herpetology. Erin has many great ideas, projects, and surveys in mind, and I look forward to working with her.

Staying on the same topic of officer elections, all of the other positions will continue to be served by the same individuals. Dave Perry will continue as secretary and Matt Close will continue as treasurer. Member Nell Koneczny also volunteered to take over management of the VHS merchandise store. During the business meeting, Matt Neff was recognized for his service as president of the VHS and looks forward to organizing great surveys in the near future.

Several surveys and events took place in 2019, details of which can be found in this issue of the Catesbeiana as well as in our periodic newsletter and on our website. More surveys and exciting research projects are currently being planned for the 2020 season, so please check our website and Facebook for up to date event announcements. I hope to see all of you at one of our surveys or events in the coming year.

Happy Herping!
Travis Anthony, VHS President

Virginia Herpetological Society
Annual Fall Business Meeting
Minutes 19 October 2019

Matt Neff, President of the Virginia Herpetological Society (VHS), opened the meeting at approximately16:17 h. EDT and provided the agenda for the meeting. VHS Executive Committee Members (Ex-Com), Travis Anthony, Michael Carr, Erin Chapman, Matt Close, Jason Gibson, Bonnie Keller, Nell Koneczny, Larry Mendoza, John Orr, Dave Perry, Mike Salotti, Paul Sattler, Emily Steele, Kory Steele, Susan Watson, Charise White and John White also participated in the meeting.

1. Surveys

a. Supplies, traps…

Matt Neff mentioned that VHS has 6 turtle hoop traps which are currently in the possession of Travis Anthony, VHS Vice President, and will be split-up among VHS Survey Group Leaders on request. Erin Chapman, Bonnie Keller, VHS Newsletter Chair, and Dave Perry, VHS Secretary, indicated they would like to take some of the VHS turtle traps and would make arrangements with Travis Anthony to obtain them.

b. 2020 Spring Survey ideas

Several potential sites were suggested for the 2020 Spring Survey including Pocahontas, Twin Lakes (Prince Edward-Gallion State Forest) and Bear Creek (Cumberland State Forest) State Parks and Prince William State Forest. However Pocahontas and Twin Lakes State Parks have been previously surveyed by VHS. Mike Salotti, VHS Community Outreach Committee Chair, suggested that the more than 8,000 acres contained in Pocahontas State Park could warrant a second survey. Erin Chapman recommended that VHS consider a survey of Widewater State. Some thought this new state park would probably need to be a special "members only" survey.

c. Dave Perry- Conservation Committee Survey

Dave Perry indicated that the Conservation Committee would most likely schedule a survey in Surry County at either Hog Island WMA or Chippokes Plantation State Park. Surry County would be a good target for the Conservation Committee as 11 tiered species have been documented there. He expressed some concern about a lack of frog and turtle sightings at Hog Island WMA during a preliminary visit in July. Jason Gibson, VHS Survey Committee Chair, suggested that the time of year may have been a factor and Susan Watson, VHS Permits Committee Chair, agreed to contact Hog Island personnel to get a read on potential herp activity there. Chippokes Plantation State Park has been previously surveyed by VHS.

d. HerpBlitz

Jason Gibson and Paul Sattler indicated the site of the 2020 14th annual HerpBlitz will be Northwest River Park in Chesapeake. This site was surveyed by VHS about 10 years ago. VHS could expect to encounter some interesting species there including Two-toed Amphiumas, Little Grass Frogs, Spotted Turtles and all three Virginia venomous snake species. The HerpBlitz is scheduled for June 13-14.

e. Fall Survey

There was a general discussion about the value of a Fall Survey and it was generally observed that it was a good learning exercise for the VHS Vice President and provided a

bridge event between the Spring Survey and the Fall Meeting in an otherwise inactive period for VHS. It was decided to let the incoming Vice President decide if and when to have a Fall Survey. An autumn follow-up to the Spring Survey was suggested as a possibility.

f. Matt Neff Survey
Matt Neff will pursue follow-up "members only" surveys at Lake Anna and Sky Meadows State Parks as there are still a lot of undocumented county records for species that are documented within the geographic range of these state parks

g. Follow-up
Paul Sattler indicated that there are three survey reports (Newport News, Featherfin, Lee County) and a Woodland Box Turtle Recapture report that will be included in the Fall 2019 edition of Catesbeiana and potentially five survey reports are in the cue for the Spring 2020 edition.

h. Anyone Else
Kory Steele, VHS Permits Committee Chair, has been in contact with the naval station in Chesapeake and there is renewed interest in Canebrake capture and tracking. Kory agreed to be the VHS contact for this program. Kory also indicated he would like to see aerial and topographical maps included with future field survey documents.

2. Liability Insurance
This topic was pursued by VHS about 10 years ago and dropped due to expense but did result in the liability waiver form. While the liability waiver form may help, it is not considered to provide much legal protection and is not being consistently used. Matt Close, VHS Treasurer, suggested there are two types of insurance to pursue 1) Event Liability and 2) Individual board member general liability. Matt is familiar with organizations that have policies costing as little as $500/yr. Larry Mendoza, VHS Regulatory Affairs Committee Chair and Matt Close will investigate and report back to the Executive Committee.

3. Fund Raising for VHS
Travis Anthony and Larry Mendoza will investigate the possibility of a Richmond area pub holding a drink night as a fund raising event for VHS.

4. Education
Mike Clifford, VHS Education Committee Chair, was unable to attend the meeting but did provide a copy of the annual Education Committee Report for the period October 2018-October 2019. To summarize Larry Mendoza held 7 tabling events for VHS and was assisted on at least one occasion by Travis Anthony, Jason Gibson, Dave Perry, Paul Sattler, Kory and Emily Steele. Live snakes were exhibited at these tabling events. A combined total of 17 VHS presentations and teaching events to various audiences were provided by Travis Anthony Erin Chapman, Mike Clifford, Bonnie Keller, Mark Khosravi, Larry Mendoza and Susan Watson. In addition, Susan Watson, in her VDGIF role, conducted 16 training/teaching events involving herps that included 5 sessions for chapters of the Virginia Master Naturalists for vernal pool monitoring on public lands and live animal exhibits. Mike Clifford provided Copperhead removal services in his local community and used each request as a teaching moment. Over 500 herp identification inquiries were made and Alonso Abugattas, Mike Clifford, Bonnie Keller, Mark Khosravi Kory Steele and John White, VHS Webmaster, handled most of the requests. John White summarized the top 10 VHS originated posts of 2019. These totaled 425,877 views and 3,086 shares. The number 1 VHS originated post was 22 May "Colorful Cooter" with 139,116 views and 895 shares.

The full report can be accessed for additional details.

5. Catesbeiana

Paul Sattler indicated that the survey report backlog is solid for the Fall 2019 and the Spring 2020 editions of Catesbeiana. What are needed are editorial reviewers from the Executive Committee. Field notes are a little light for the Fall 2019 edition, which may be attributable to the hot and dry weather over the last few months.

6. Grants update

Kory Steele mentioned that in 2019 VHS funded only two to three grant proposals. Part of the past VHS philosophy was to fund quality grant proposals and to attempt to avoid having to turn down too many grant proposals. In the past there was no apparent need to promote the program but now there is a desire to receive more quality grant proposals. Several ideas were discussed to further this objective including raising the upper grant amount limit from $500 to $1,000, outreach to a larger number of universities, development of alternative grant types such as conference travel re-imbursement and education grants etc.. There was some concern that $1.000 upper grant amount might limit the number of grant proposals that could be funded. Kory Steele agreed to review the various ideas for possible implementation. 2020 grant award proposals are due by January 15, 2020.

7. Permits

Susan Watson mentioned that the VHS Exhibitor Permit will soon expire and she will be working on the renewal during the next week. A new Scientific Collection Permit will be required for 2020 and 2021 and the application will be made once some of the projected 2020 surveys are firmed up. Susan reminded 2019 survey leaders that she will need species/specimen counts in January 2020. There was a discussion about specimen retention. Susan indicated that retention is currently only permitted for injuries or larvae identification. There may be a future possibility to get a limited agreement from VDGIF for retention of certain non-tiered species for education purposes. Mike Salotti indicated that he is seeking approval from VDCR management about possible specimen retention for education.

8. Newsletter update

Bonnie Keller apologized for missing the September VHS Newsletter deadline. To avoid a conflict with the publication of the Fall edition of Catesbeiana it was suggested that Fall newsletter should not be published until January. As the next deadline for the VHS Newsletter is March 2020, it may desirable to combine the two.

9. Regulatory Affairs

Larry Mendoza reported that VDGIF will schedule a meeting in Charlottesville in November/December to review plans and preliminary results for "Restore the Wild' which is an effort to increase wildlife viewing opportunities within wildlife management areas. Larry plans to attend to promote herp viewing opportunities and determine how VHS might participate as an organization. There is also a VDGIF effort to get more ethnic and racial diversity in wildlife viewing and park activities.

10. Outreach

a. Membership

VHS has a total of 358 members which is an increase of 30 since the Spring Survey. Of the 358 members, 65 are lifetime members. However, new membership applications are not being processed efficiently. Emily Steele mentioned that she still receives email complaints from PayPal, even though she has not been VHS Secretary/Treasurer for many

years, about a lack of VHS acknowledgement of payment receipt or membership status. It was suggested that an automatic redirect program be established with PayPal and VHS where a thank you note and membership acknowledgement would be sent from VHS directly to the member. Matt Close and John White agreed to investigate this possibility. There was also a discussion about the need to improve membership benefits. One idea was to provide some handouts for new members (pens, bumper stickers etc.) or provide these during field surveys. Some suggested VHS items available for sale on Cafépress should be improved as very little VHS merchandise is sold. Matt Close indicated the VHS commission from Cafépress is only $15-20 twice per year. A new t-shirt with the new VHS logo was proposed. In general there is disappointment in VHS merchandising effort. However, Nell Koneczny volunteered to lead the VHS merchandise effort and was unanimously approved as VHS Online Store Manager. Nell will have the authority to determine whether VHS will continue with Cafépress or seek an alternative.

b. Tabling Events

Larry Mendoza has been coordinating and leading all VHS tabling events. Larry indicated that board graphics need to be improved. There is a special need for new photographs. It would also be helpful if a new lower weight board could be provided. Pens and stickers are fine handouts and the supply is good.

11. Treasurer

Matt Close reported that the gross cash balance (prior to the meeting today) is $16,035. Of this $6,097 is in a certificate of deposit ($97 is earned interest on the original $6,000 deposit) which leaves funds currently available to spend at $9,938. Revenue obtained from the auction and silent auction today totaled $668, which is probably sufficient to cover the cost of this meeting.

12. Follow-up from Spring Meeting

a. Red Salamander License Plates

Travis Anthony and Susan Watson reported that VDGIF had moved on to non-game species for Virginia DMW license plates and are now working on the Northern Red Salamander license plate. The color may change slightly and the position of the salamander flipped from what was previously presented. We will need to alert VHS membership when the license plates are available.

b. County Records Criteria

Since the 2019 Spring Meeting Erin Chapman has researched Virginia Cities and Counties herp distribution records to identify possible improvements for the current VHS policy on distribution records. Erin determined that I-Naturalist could not be recognized outright due to the five mile diameter observation range parameters for sensitive species. Due to this constraint, individual I-Naturalist observations can only be verified through written reports provided by the field observer (many are unwilling). Erin uncovered 131 herp records from 74 independent cities and counties. 28 (38%) of these were independent cities encompassing 64 (47%) of the records found. However, 88 (67%) of the total 131 records were from I-Naturalist meaning substantial effort would be needed to verify these records to determine if VHS needs to amend its policy on distribution records. Kory Steele contacted Steve Roble to find out why VHS had in the past decided not to include some city records and Steve indicated it was simply too much work. Paul Sattler suggested that VHS continue to follow VDGIF standards that document FWIS records for all Virginia counties and some cities and that VHS should be very careful with I-Naturalist records. These records could be considered if the field

observer agreed to written documentation. There was general agreement with Paul's recommendations.

13. Elections

The following candidates were nominated and unanimously confirmed as VHS officers for the next two year period:

President: Travis Anthony
Vice President: Erin Chapman
Treasurer: Matt Close
Secretary: Dave Perry

There being no other business to discuss, Matt Neff adjourned the meeting at approximately 18:20 h.

Dave Perry
VHS Secretary

Joseph C. Mitchell (1948-2019)

It is with sadness the VHS marks the recent passing of Dr. Joseph C. Mitchell. Joe was an important figure in the VHS and will be missed greatly. He was the author of The Reptiles of Virginia, the Atlas of Amphibians and Reptiles in Virginia, many other books and more than 500 scientific papers. An obituary is planned for the Spring 2020 issue of Catesbeiana. A short video of Joe can be found at:

https://nam04.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.youtube.com%2Fwatch%3Fv%3DDBXqN7zwojQ%26t%3D38s&data=02%7C01%7Cpwsattle%40liberty.edu%7C78c0d4a5af28426c3df308d76dc7eaa5%7Cbaf8218eb3024465a9934a39c97251b2%7C0%7C0%7C637098577723580216&sdata=cRRKoi5lUuTaA%2Fia6hBn8sSdEgc3dRTkdbd9Z00pw80%3D&reserved=0

Virginia Herpetological Society
Treasurer's Report Draft
Nov 21, 2019

Previous Balance– May 17, 2019, Gross	$	15,400.40
Savings C.D.	$	6,000.00
Unencumbered	$	9, 400.40
Net Receipts (excludes PayPal Fees)		
Dues	$	2810.00
Donations	$	330.00
VHS Fall Meeting Auctions and Sales	$	825.74
Café Press Store	$	31.57
Amazon Smile	$	167.57
Expenses		
Web Hosting	$	287.54
Spring Survey	$	127.69
Fall Meeting	$	601.28
Tabling and Promotional Materials	$	1109.51
Educational Events	$	418.35
Awards	$	328.70
Current Gross Balance	$	16,657.75
Savings C.D.	$	6,096.37
Current Available Balance (unencumbered)	$	10, 561.38

VHS Memberships (dues current)	
Regular:	261
Student:	21
Lifetime:	65
Total	**347**

Matthew Close
VHS Treasurer

Field Notes

The field notes section of *Catesbeiana* provides a means for publishing natural history information on Virginia's amphibians and reptiles that does not lend itself to full-length articles. Observations on geographic distribution, ecology, reproduction, phenology, behavior, and other topics are welcomed. Field Notes will usually concern a single species. The format of the reports is: scientific name (followed by common name in parentheses), state abbreviation (VA), county and location, date(s) of observation, observer(s), data and observations. The name(s) and address(es) of the author(s) should appear one line below the report. Consult the editor if your information does not readily fit this format. **All field notes must include a brief statement explaining the significance of the record** (e.g., new county record) **or observation** (e.g., unusual or rarely observed behavior, extremely early or late seasonal record, abnormal coloration, etc.). Submissions that fail to include this information are subject to rejection. Relevant literature should be cited in the body of the text (see Field Notes in this issue for proper format). All submissions will be reviewed by the editor (and one other person if deemed necessary) and revised as needed pending consultation with the author(s).

If the field note contains information on a **new county (or state) record**, **verification is required in the form of a voucher specimen** deposited in a permanent museum (e.g., Virginia Museum of Natural History) or a **photograph** (print, slide, or digital image) **or recording** (cassette tape or digital recording of anuran calls) deposited in the archives of the Virginia Herpetological Society. Photographs and recordings should be sent to the editor for verification and archiving purposes; the identity of voucher specimens must be confirmed by a museum curator or other qualified person. Include the specimen number if it has been catalogued. Prospective authors of distribution reports should consult Mitchell and Reay (1999. *Atlas of Amphibians and Reptiles in Virginia*), Mitchell (1994. *The Reptiles of Virginia*), and Tobey (1985. *Virginia's Amphibians and Reptiles: A Distributional Survey*) **[both atlases are available on-line on the VHS website]** as well as other recent literature to determine if they may have a new county record. New distribution records from large cities that formerly constituted counties (Chesapeake, Hampton, Newport News, Suffolk, and Virginia Beach) are acceptable, but records from smaller cities located within the boundaries of an adjoining county will only be published if the species has not been recorded from that county. Species identification for observational records (e.g., behavior) should be verified by a second person whenever possible.

PHOTOGRAPHS

High contrast photographs (prints, slides, or digital images) of amphibians and reptiles will be considered for publication if they are of good quality and are relevant to an accompanying article or field note. Digital images are preferred. Prints should be on glossy paper and no larger than 5 x 7 inches. Published photographs will be deposited in the Virginia Herpetological Society archives.

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